THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., OCTOBER 17, 1889.

THE WEEK IN IRON CIRCLES.

General Features.

The history of the iron market for the past week has been the repetition of that for several weeks previous, viz.: strong and increasing demand and steadily advancing prices. Chicago reports that the demand there favors all grades about alike and the improvement is shared by all, though perhaps less by Lake Superior charcoal irons than coke irons. Old car wheels are dull selling, the use of this material not being as large by wheel-makers as formerly. Foundries and mills are busy and all are looking forward to the largest season's work they have ever enjoyed. Many foundries are increasing their capacity largely so that Chicago will soon become, if it is not already, the largest consuming center in the country for foundry pig iron. The transactions in raw iron at Pittsburgh during the past week were in volume very nearly the largest in the history of the trade for any similar period, and the market continues to absorb all offerings of standard brands. Grey forge has advanced fifty cents per ton since last report, and there is a steady demand for present and future needs, although producers are not eager to enter contracts of any magnitude which stipulate forward delivery. Foundry grades move freely at quotations given, but do not command as much as usual above the price of mill iron. Bessemer iron is causing considerable excitement, and the demand is far in excess of the supply, sales having already been made for shipment in January and February at prices higher than are here named. Wm. F. Jarvis & Co., Detroit, write: "Notwithstanding the advances that have been made in nearly every grade of iron, and also notwithstanding the acknowledged strong market, our buyers hereabouts have remained free from any excitement during the past week, when several lots being inquired for developed the fact that it was absolutely impossible to have their wants supplied with the usual brands, and "tag ends" were then in demand, and a number of them were literally "gobbled up." Finally also this condition of affairs seems to have been generally accepted by the buyers of Lake Superior charcoal pig, and larger lots have been sought for, while advances have been made and obtained, of from fifty cents to $1 per ton. Very little metal even at these figures is available, and further advances must follow in consequence for future deliveries. The almost certain response of furnaces making any grade of iron is, 'entirely sold up to January 1st,' and with every branch of the iron business running to its fullest extent, it does not seem possible that prices can be anything but considerably higher from this time on." A decidedly firmer tone has pervaded the Louisville market during the past week and not only have prices stiffened, but the available supply is very light. Buyers find it difficult to obtain either the grades or deliveries desired, and trading in consequence has not been in such large quanties as it otherwise would have been. Furnaces are refusing to sell except such odd lots as they may have, and then for immediate or nearby delivery, while some of the buyers have displayed anxiety to place orders for extended shipment. There are some exceptions, however, and occasionally a round quantity for extended delivery is reported sold. There has been some movement in charcoal iron, though the bulk of the demand has been for coke metals. Last week closed at Cincinnati with more life and annimation in the market than are perhaps wholesome. The fact that the supply of certain grades has almost given out has created uneasiness and apprehension, which are the first conditions of a boom. There is iron enough for all, but in proportion as this or that grade becomes scarce, the desire to buy it far ahead becomes strong. Grey forge, in particular, is the grade most wanted and none of the furnaces have any for deliveries this year, excepting an occasional one that has been holding a stock for higher figures. We have the anomaly, therefore, of grey forge being held at within 25 cents or 50 cents per ton of the price of No. 2 foundry or No. 1 soft. It certainly cannot be said that there is an effort on the part of the leading companies, South or North, to force prices up. The responsibility is rather with buyers who want to anticipate wants largely, fearing higher prices later. Charcoal irons have not responded to the movement in other grades, but are firmer and stronger. The special activity is in grey forge, mottled and perhaps No. 3 foundry, which are the most notable for scarcity, with heavy demand and active buying. During the past week there has been comparative little inquiry in the St. Louis market, although great activity is reported further East. It is expected that this temporary lull will be succeeded by a strong buying movement within the next two weeks. Prices are being marked up gradually, and there is a scarcity of the lower grades of Southern coke irons.

Iron Ore.

The varying and unsettled condition of the freight market, even at this late day, is liable to make itself severely felt in the sum total of ore to come to lower lake ports before the close of navigation. The ore men claim that by a combination, aided by a boom in the daily newspapers, lake freights have taken a sudden jump that is not justified by the conditions of trade, and that this advance, while possibly benefiting a few vessel owners, will eventually shut off their sources of revenue. The rates, at this writing, are $1.60 from the head of Lake Superior, $1.45 to $1.50 from Marquette and $1.25 from Escanaba. Most, if not all, of the charters have expired, which, in a measure, accounts for the possibility of a combination, but on the other hand, furnaces that would contract for low grade ores yet to be mined for this season's delivery, have countermanded their orders, not caring to buy ores simply to add to the vessel-men's profits. If freight should continue to advance, no ore will be shipped in excess of contract orders, and the vessel-men will have themselves to blame for the falling off.

Pig Iron.

The market continues active and strong, the inquiry being chiefly for Bessemers and forge iron. Bessemer sells freely at $20.50 cash, at the furnace, and a good mill iron is worth $17 cash, in Cleveland. All this, of course, is for small lots and for immediate delivery. The capacity of nearly all the furnaces is fully engaged until the close of the year, and nobody cares to quote prices for delivery after January 1. The demand is strong for all grades of iron, American Scotch and foundry irons selling well up to the list. Furnace-men are not willing to make any concessions as to price, the enormous demand assuring them of a market at their own quotations.

Merchant Iron.

A betterment is noted in the bar iron market, the price being $1.75 at present. The mills have largely disposed of their output for sometime ahead, which accounts for the improvement in this line. Sheets are very scarce and correspondingly high. There is less of this class of material in sight than has been the case in many years. The demand for heavy plate is extraordinarily large, and small channels are actively inquired for.

Scrap Iron.

Despite the rumors of further advances of from $1 to $2, old American rails are still bought at $26, as one 700-ton sale this week demonstrates. Good railway scrap is strong in price, and is somewhat scarce.

Hardware.

In a general way the market is very good, without any noteworthy specialties. Nails are very strong and are expected to advance soon.

THE DRIFT TOWARD THE CENTRAL WEST.

Of more than isolated interest is the decision of Rathbone, Sard & Company, the extensive stove manufacturers of Albany, N. Y., to establish a plant at Aurora, Ill. It is but another significant straw showing which way the industrial wind blows. As stated by Mr. Sard, in a recent interview with the editor of *The Iron Trade Review*, the move has been the result of a careful study of the relative situation of raw materials and markets, culminating in the conviction that, in order to manufacture most economically and, at the same time, reach their principal markets most cheaply and expeditiously, a central western location was an absolute necessity. That the choice fell on an Illinois point does not necessarily settle the fact that that is either the center or western limit of the drift—it was simply considered the best location, all things considered, for this particular enterprise. At the same time it has a most important bearing on the general question as to the ultimate drift of large iron concerns to the teeming territory known as the "Central West," and its significance in this respect should not be lost sight of. Properly considered, it will explain a great many things in connection with the recent ill-timed anti-tariff legislation in New England.

The comments of an influential Eastern journal upon this particular point are interesting at this time. In the course of a long article headed "Manufacturers Moving Westward, the *Iron Age* says

> The movement to the West is, however, not of recent origin. It has been in progress for years in other lines of business than the manufacture of stoves. Many Eastern concerns have long had branch establishments located at points in the West specially advantageous for their trade. It was foreseen by shrewd business men that the West would not long remain dependent upon Eastern factories for its supplies, but that Western enterprises would be started to meet local demands, and that they would secure important advantages over their most distant competitors. This has actually been realized in more than one industry. There are to-day in operation at Chicago, St. Louis and a number of other manufacturing centers, which might be mentioned, large establishments whose products have outgrown the local market, and are being shipped to the East in direct competition with the products of factories located there. We allude especially to concerns wholly of Western origin which have started in a small way, and have grown with the development of their section. They secure their raw materials as cheaply as they could in the East, and are not obliged to pay a higher rate of wages.
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> The Interstate Commerce law is credited in some quarters with the recent migration of industries to the West. In a few instances this is probably an active influence, as special rates can no longer be secured through favoritism or the corruption of railroad officials. With all on an equal footing so far as freight rates are concerned, those most distant from the general market must suffer loss of trade unless they have compensating advantages to equalize cost. But the freight question is overshadowed in importance by the results flowing from the constant cheapening of the cost of manufacturing in the West. Not only are raw materials so cheap that the West is becoming independent of the East, but the labor question is no longer the serious matter that it was but a short time since. The population of the West has increased so rapidly of late years, and skilled and unskilled workmen are now so numerous, that the payment of a premium to induce workmen to operate Western factories is obsolete. With cheap raw materials, with no dearer labor and with their customers at their very doors instead of 500 to 1,000 miles away, it is no wonder that the Western manufacturers are taking the trade, which, at one time, kept machinery in profitable motion along the Hudson, the Connecticut or the Merrimac.
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> The extraordinary development of the railroad systems of the Central West has also had much to do with the movement under consideration. In no other part of the country are there so many independent lines competing for business, and the natural result is that freight rates are moderate in every direction from what have grown to be the great centers of railroad traffic. The number of independent railroad lines running to Eastern cities and manufacturing centers is very small in comparison, and freight rates are maintained on a higher basis. In this respect the Central West bids fair to maintain permanently an advantage over the East.

We desire to commend the broad view taken in the above, and to remind again our Southern enthusiasts that there are other sections than their own that are showing equally marvelous industrial growth—only less noise is made about it.

NATURAL GAS AND LABOR TROUBLES.

Not only have some of the Pittsburgh iron works found it necessary to close down at inconvenient times because of the insufficient supply of natural gas, while others have been compelled to stint themselves on their early morning supply in order to allow house-holders a chance to cook their breakfasts, but the trouble has extended to the employes as well. For some time past, it appears, the mill owners have found it necessary, in view of the new conditions, to slacken up on their work in the forenoon and increase it at night. This has generally been done with the acquiescence of their employes, but now the employes in several mills have taken the decided stand that they will not accept the new order of things, and the manufacturers find themselves between two fires—and they are not natural gas fires, either—namely whether they can secure a more steady supply of fuel, or, failing in that, whether they can arrange the hours of work to suit their employes. It is an interesting problem all around, and its solution will be awaited with anxiety.

Referring to the subject under consideration, the *National Labor Tribune* makes this suggestion: "We would suggestt hat puddling and heating furnaces be fitted to burn natural gas and coal in combination. A trial of this some winters ago in a grate proved very satisfactory. The gas supply was short to about 10 per cent. of the usual amount, and a few large lumps were placed in the grate. With the aid of the gas the combustion of the coal was smokeless and perfect, making a beautiful and effective fire, with the only refuse a white ash the exact form of the lumps of coal, which became a powder upon being handled for removal. It is not unlikely that with one-fourth the gas now used in furnaces and about the same proportion of the coal formerly used, puddling and heating furnaces could be run successfully, and if successfully, very economically as compared with present cost."

It is certainly strange that apparently so practical a suggestion as this should not have been acted upon long ago. That any relief from the present strain will be permanent, even the most sanguine natural gas enthusiast will not claim. The longer the present situation is allowed to remain, the more embarrassing it will become. Pittsburgh manufacturers are not of the sort to stand trifling. Their action in the premises will no doubt be prompt, decisive and effectual.

THE ACTIVITY IN STEEL RAILS.

It is estimated by competent authorities that orders for probably 300,000 tons of steel rails have been placed within the last ten days. These include one order of 40,000 tons for the Pennsylvania Company for 1890 delivery at a price slightly below the current Eastern price, $31 to $32; 42,000 tons for the Union Pacific; 25,000 tons for the Erie, and smaller quantities by the Chicago, Burlington and Quincy, Northwestern, Rock Island, "Big Four," Lake Shore and several Southern and Southwestern roads. The peculiar significance of these orders, at the present time, does not lie in the fact that they were unexpected, for it is well known that they are for repairs and betterments long needed, the orders being held off until such time as purchasing agents were convinced that nothing could be made by further waiting. Nor do they indicate any particular increase in railroad building, as will appear from a study of the figures of railroad construction for the past nine months, given in another column. To the steel rail manufacturers they are interesting in view of the fact that they "set the pattern" for lesser roads and that, as has already occurred, they have put in motion active negotiations for a large number of smaller orders, making in the aggregate, however, a sufficient quantity to probably insure work for all the mills during 1890. Should there follow a revival of railroad extension, there is no knowing where the present activity would end. In the meantime, the market is very firm, with a decided upward tendency, quotable prices being from $31 to $33 in the East and from $33 to $36 in the West.

It is interesting to note that our imports of steel rails during the eight months ending August 1, 1889, show a heavy falling off, being 6,163 tons, valued at $161,969, as against 53,596 tons, valued at $1,277,095 during the corresponding eight months of 1888. Our steel rail industry seems to be able to get along.

ALMOST without exception, manufacturers of all kinds of machinery report a very prosperous season and a most encouraging outlook. This favorable condition of things is felt not alone by manufacturers of heavy machinery, but by makers of wood-working tools, machinists' supplies, hardware, etc., as well. The demand for power plants seems to be unparalleled in activity, while a corresponding demand is noted for pumps, heaters, injectors and other attachments used in connection therewith. We doubt if the opening of the Autumn months has for years shown so favorable an outlook, all things considered.

THE interesting fact was brought out, at the recent meeting of the British Iron and Steel Institute, that electric welding was no new thing, the process having been employed twelve years ago in welding the Atlantic cable. However, it has remained for American inventive genius to apply it on a larger commercial scale, to the extent of awakening a decided interest on both sides of the ocean.

WE are pleased to note the activity of the American Boiler Manufacturers' Association, which held its annual convention in Pittsburgh on Tuesday and Wednesday of this week. When boiler

manufacturers, representing a combined capital of $1,000,000,000, meet to discuss such practical questions as "Materials and Tests," "Riveting and Caulking," "Man-heads and Man-holes," "Safety Valves and Horse-Power," and other topics looking to improvement in materials and construction, in this important industry, there is good reason for rejoicing.

HAVING, by request, said a good word for New York and Chicago in the matter of the World's Fair of 1892, we cannot do less than honor the request of the able and intelligent St. Louis committee for a like favor. We therefore take pleasure in saying that if Chicago, our first choice, can't get it, St. Louis should have it. As to New York—well, when New York gets through talking about what it is going to do, and does something, the time may come to say a word or two about New York.

OUR imports of iron ore show a slight increase during the past two-thirds of a year over the corresponding period of 1888. For the eight months ending August 1, 1889, they amounted to 553,974 tons, valued at $1,238,207, as against 429,774 tons, valued at $925,727 a year ago.

IT is the opinion of the Boston *Commercial Advertiser* that the amount of English operations in this country at present is largely over-estimated. It is safe to say that the values of the plants thus far disposed of have not been over-estimated.

A New Water Pipe.

It is stated that Mr. Mephan Ferguson, of Melbourne, is the patentee of an invention calculated to be of great service to the mining community, and will also prove very useful in all works where water has to be conveyed for any great distance in pipes for domestic or irrigation purposes, the small cost rendering it an easy matter to overcome the natural surface difficulties that sometimes hamper property owners when they have to carry the water over gullies or ravines. The patented pipes are made in lengths of 3 feet, so that they are not only easily handled or transported, but much labor is saved in vertical riveting. Each length of pipe being slightly beveled between the ends and closely riveted, the jointing is effected by heating and expanding the larger end of pipe, and is thus shrunk on. A considerable saving is thus effected in the jointing, for neither lead nor yarn is required, and the pipes can be jointed by comparatively inexperienced men. The pipes are coated both inside and outside, principally with patent prepared Trinidad asphaltum, which renders them impervious to injury, either by the atmosphere or by mineral acids or water. Tests of these pipes have been made in the presence of Mr. Davidson, of the Melbourne Water Supply Department, and others, with very satisfactory results, inasmuch as at a pressure of 450 pounds to the square inch the pipe burst, but the joint remained intact. With regard to the laying of the pipes, with the material, on the ground and under ordinarily favorable circumstances, the inventor claims to be able to lay down a quarter of a mile of piping per day.

Bessemer Iron and Steel Making South.

The *Manufacturers' Record* can positively announce that, outside of the extensive Bessemer ore deposits at Llano, Tex., which have been fully described in this paper and which are believed by some experts to be the greatest in this country, there are other deposits in the more central South of enormous magnitude, easily mined, accessible to the finest coking coal in the country and sufficient to meet the requirements of the greatest possible steel-making industry that can be developed for generations to come. These are strong statements, and we fully appreciate the fact that many people will hardly believe it possible that they can be true; but the *Manufacturers' Record* knows full well what it is asserting, and is perfectly willing to leave the matter of the correctness of its position to the developments of the near future. We repeat the statement lately made, in these columns, that the South will soon have equally as great advantages in the production of Bessemer iron and steel, as compared with Pennsylvania, as it has had for years in the production of other grades of pig iron. The developments that will be made in the South during the next few months will be greater and of more far reaching importance to all sections of the country than was the iron making and furnace building boom of Alabama two years ago, which followed the demonstration that Southern furnaces could live and make money during the severest depression in iron.—[Baltimore Manufacturers' Record.

Soft Alloy for Soldering.

A soft alloy which attaches itself so firmly to the surface of metals, glass and porcelain that it can be employed to solder articles that will not bear a very high temperature, can be made as follows: Copper dust obtained by precipitation from a solution of the sulphate by means of zinc is put in a cast iron or porcelain-lined mortar and mixed with strong sulphuric acid, specific gravity 1.85. From 20 to 30 or 36 parts are taken, according to the hardness desired. To the cake formed of acid and copper there is added, under constant stirring, 70 parts of mercury. When well mixed the amalgam is carefully rinsed with warm water to remove all the acid, and then set aside to cool. In ten or twelve hours it is hard enough to scratch tin. If it is to be used now, it is to be heated so hot that when worked over and brayed in an iron mortar it becomes as soft as wax. In this ductile form it can be spread out on any surface, to which it adheres with great tenacity when it gets cold and hard.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

October 1, 1889.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	14	7	670	7	475					
New York	9	0	0	9	1,226	4	2	1,631	2	2,274
Pennsylvania	21	8	448	13	810	1	1	748	0	0
Upper Susquehanna Valley						1	0	0	1	200
Pittsburgh						20	20	22,725	0	0
Spiegel						1	1	721	0	0
Allegheny Valley						2	1	597	1	125
Shenango Valley						21	16	11,296	5	2,180
Youghiogheny Valley						5	4	1,598	1	525
Juniata and Conemaugh Valleys						22	11	4,423	11	4,464
Spiegel						1	0	0	1	250
Maryland	9	2	207	7	565	5	0	0	5	1,721
Virginia	22	4	218	18	911	14	8	4,055	6	2,378
North Carolina	2	1	153	1	240					
West Virginia	3	0	0	3	190	6	2	1,511	4	1,845
Ohio—Mahoning Valley						15	12	9,104	3	1,832
Eastern, Central and Northern						17	13	9,642	4	3,304
Hocking Valley						15	3	1,080	12	2,672
Hanging Rock	15	7	472	8	765	14	7	1,519	7	1,638
Miscellaneous	1	0	0	1	200					
Kentucky						4	2	519	2	600
Hanging Rock	2	2	189	0	0					
Western Region and Miscellan'ous	2	0	0	2	154					
Tennessee	9	5	1,259	4	355	10	7	3,709	3	1,820
Georgia	2	1	175	1	98	2	1	610	1	675
Alabama	13	9	2,125	4	910	36	23	14,518	13	7,577
Indiana						2	0	0	2	383
Illinois						16	11	12,468	5	2,907
Michigan	25	12	4,015	13	4,220	1	0	0	1	300
Wisconsin	5	3	1,444	2	392	4	2	710	2	1,001
Minnesota	1	0	0	1	140					
Missouri	3	2	677	1	240	6	2	1,194	4	2,455
Texas	2	1	210	1	100					
Oregon	1	1	160	0	0					
Colorado						2	0	0	2	960
Utah	1	0	0	1	80					
Washington	1	1	250	0	0					
Total charcoal and coke	163	66	12,672	97	12,071	247	149	104,378	98	44,086
Total anthracite	189	98	36,496	91	23,818					

SUMMARY.

FUEL.	IN BLAST. Number.			IN BLAST. Weekly Capacity.			OUT OF BLAST. Number.		OUT OF BLAST. Weekly Capacity.	
	Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.	
Charcoal	66	69	73	12,672	11,769	12,983	97	96	12,071	13,228
Anthracite	98	94	99	36,496	35,497	29,586	91	95	23,818	21,438
Bituminous	149	137	138	104,378	92,915	87,141	98	111	44,086	52,719
Total	313	300	310	153,546	140,181	129,610	286	302	79,975	90,385

New Railway Construction.

In its current issue the *Railroad Gazette* prints a table showing the new construction of railroads in the United States for the first nine months of the calendar year. The total for the United States is 3,110 miles and for the United States, Canada and Mexico 3,750 miles. It appears from these figures that the rate of building in 1889 as compared with 1888 has improved in the third quarter. In the first and second quarters only about half as much new road was built as for the corresponding periods in 1888. At the end of the third quarter we find that the proportion has risen to about three-fifths. This was foreshadowed at the end of the second half year, when the amount of line reported as under construction was quite as great as it had been in the preceding year. Reasoning by proportions only, the amount of railroad built in the first half indicated a total new construction of 3,500 miles in 1889. The figures for the three-quarters of the year used in the same way indicated 4,200 miles of new main line for 1889. Writing on this subject three months ago, the *Gazette* said that, considering the condition of business and of the market for for securities, it seemed likely that some of the lost ground would be regained. That, we see, has been the case. More new road has been built in the third quarter of the year than was built in the first half. In six months the new construction amounted to 1,480 miles; in the three months to Sept. 30 it was 1,630 miles. There is excellent reason to think that the last three months of the year will show even a greater new mileage; but if it is no more the total for the year will amount to 4,600 miles. A new mileage for 1889 of 5,000 miles is not at all an unreasonable estimate. The last three years have accustomed us to such large figures that this seems a small increase, and it is much smaller than the average for the last 10 years, which has been about 7,600 miles a year; but it is enough for the basis of a good business, and it is more than could have been confidently expected early in the year. The amount of road now reported as under construction is about 5,800 miles against about 4,450 three months ago. This again, so far as it goes, indicates that there is not likely to be any falling off in builing in the last quarter of the year. The Southern states east of the Mississippi still contribute much more to the total amount built than any other section, viz., 44 per cent. In the first half year this group built 45 per cent. of the whole. In 1888 they built 31 per cent. The Northern states east of the Mississippi have built 20 per cent. against 17 per cent. in the first half year. The Southwestern states, with Kansas and Colorado, have built 19 per cent. against 24 per cent. in the first half year. The Northwestern states contribute about 6 per cent. and the Pacific coast 11 per cent. of the new mileage so far built.

AMONG the American inventions that are attracting a large amount of attention abroad is the famous Maxim gun.

EXPERIMENTS ON IRON AND STEEL.

We have received from Mr. James E. Howard a most interesting paper on the "Physical Properties of Iron and Steel at High Temperatures," giving the results of experiments made at Watertown Arsenal, Watertown, Mass. A large number of bars were tested, the co-efficient of expansion of each being carefully measured, and the temperature of the bars during the subsequent tests determined by observing the elongation, by heat, of measured lengths of them. It appears that "the tensile strength of steel bars diminishes as the temperature increases from zero, Fah., until a minimum is reached between 200° and 300° Fah.; the milder steels appearing to reach the place of minimum strength at lower temperatures than the higher carbon bars. From the temperature of this first minimum strength the bars display greater tenacity with increase of temperature until the maximum is reached between 400° to 650° Fah." The greatest loss of strength, in passing from 70° to the temperature of first minimum strength, was 6.5 per cent., at 295° Fah. The greatest gain over the strength of the metal at 70° was 25.8 per cent., the maximum point being reached at 460° Fah. "The elastic limit appears to diminish with increase of temperature. Owing to a period of rapid yielding without increase of stress, or even under reduced stress, the elastic limit is well defined at moderate temperatures with most of the steels. Mild steel shows this yielding point up to the vicinity of 500° in hard steels, if present, it appears at lower temperatures. . . . It appears that the contraction of area of the mild and medium hard steels is somewhat less at 400° to 600° than at atmospheric temperatures, and within this range there is a tendency to fracture obliquely across the bar. The hard steels showed substantially the same contraction up to 500° Fah. Above 500° or 600° the contraction increases with the temperature of the metal. . . . One specimen of steel, fractured at the temperature of 1,572°, contracted 98.9 per cent."

Experiments were also made with riveted joints and steel boiler plates, at temperatures ranging from 70° to 700° Fah. "Joints at 200° showed less strength than when cold; at 250° and higher temperatures the strength exceeded that of cold joints; and when over-strained at 400° and 500° an increase of strength was found upon completing the test cold. . . . Rivets that sheared cold at 40,000 to 41,000 lbs. per square inch, sheared at 46,000 lbs. per square inch at 300°; and at 600°, the highest temperature at which the joints failed in this manner, the shearing strength was 42,130 lbs." The paper from which we quote contains six valuable plates in addition to the many tables, and throws a good deal of light upon some vexed questions.—[The Locomotive.

CHEMICAL RESEARCH IN METALLURGICAL INDUSTRIES.

The inaugural address of Sir J. Lowthian Bell, F. R. S., as president of the chemical section, of the recent meeting of the British Iron & Steel Institute, was devoted to the importance of "Chemical Research in Metallurgical Industries." He said: "It had occasionally been the practice of former occupants of the chair to devote a considerable portion of the presidential address to the more recent discoveries in chemical science. That branch of learning advanced now with such rapid strides and covered so wide a field that no one who had not made it the business of his life could hope to discharge that duty with even a moderate share of success He had selected the metallurgy of iron as the subject of his address, not only from his greater familiarity with its details, but because, in his judgment, it afforded a suitable example for the object he had in view. It was needless to insist on the disadvantage attending the application of a science to practical work without a fair knowledge of the principles which regulated its action. At the same time, it would be unfair to those who were engaged in the manufacture of iron during the first half of the present century, to deny the value of the services rendered to their art without giving much thought to the laws of nature, upon which their processes depended. The work so performed sufficed, nevertheless, to place the world in possession of the metal in such abundance, and at so low a cost that no engineering works had been delayed on account of the high price of, or absence of the required quality in the produce of our iron works, during the period in question. On the other hand, it was not to be denied that since the iron-masters had allied themselves with the chemist, they had made more progress in 30 years than their predecessors did in three centuries. No one unacquainted with the archæology of the iron trade could suppose that the colossal furnaces pouring forth their streams of molten metal, followed by the rapid action of the Bessemer converter, were the modern representatives of the iron-making appliances of former days. Out of the latter, in a low hearth, not larger than a domestic fire-place, often dependent on the wind for their blast, a few pounds of ore were, at a considerable cost for labor, fuel and waste of metal, converted into malleable iron. By means of a modern furnace in an hour and a half a ten-ton converter could be filled with liquid cast iron, which in twenty minutes might be run into ingots cheaper, stronger, and more malleable than the best wrought iron of our ancestors, or indeed of our own manufacture.

"Sir Lowthian alluded at considerable length to various processes, and gave a quantity of statistics showing the appropriation of heat and its equivalent per ton of iron, and the quantity of oxygen and carbon in gases per 1,000 tons of pig iron produced. He concluded his address as follows: Before closing this portion of my official duty I cannot refrain from tendering to chemists an assurance of the great advantage the manufacturers of iron feel they have derived from the lessons taught them by chemical science. I am the more anxious to do this because we, among others, have been reminded that we are losing the supremacy among industrial nations we once enjoyed for want of that knowledge of chemistry which is more assiduously cultivated abroad than it is in our own country. I am not prepared to deny that the opportunities for acquiring a scientific education are less generally spread here than is the case in France, Germany, or Belgium, but for this the nation and not the iron trade in particular is responsible. It must also be admitted that, as manufacturers, we no longer stand so far above other land as we formerly did. In this result any differences of education are in no way concerned, for if I were to classify the nationalities of the various inventions enumerated in the course my remarks the fears of those who are alarmed at the appearance of a Belgian girder or a German steam engine on our shores would, I think, be allayed. Perhaps I might be allowed to offer a few words on the technical side of this important question of education. Much I shall not be able to say, because I have not yet been able to learn the precise position the subject occupies in the minds of its most earnest advocates. If it means, as is sometimes alleged, a system by which, along with scientific instruction, manual dexterity in the use of tools or a practical knowledge of various manufacturing processes has to be acquired, I confess I am not sanguine as to the results. Certain I am that if foreign workmen are more skillful in their trades, which, as a rule, I doubt and which in the iron trade I deny, this superiority is not due to scientific training in the manner proposed, for in this they possess, so far as I have seen, no advantage over our own workmen.

"My objection to the whole system is the impossibility of anything approaching a general application being practicable. I have not a word to say against the rudiments of science being taught wherever this is possible. The knowledge so obtained often give the future workman a more intelligent interest in his employment than he at present possess, but I think they who expect much good to attend such a thin veneer of chemistry or physics do not take sufficient account of the extent of the knowledge already possessed by more highly educated men, who are now directing the great workshops of the world. It is by extending and enlarging this that substantial aid has to be afforded to industry and science, and not by teaching a mere smattering in our primary or any other schools. In the case of young people, who from necessity must leave the school-room at an early age, my own leaning is towards the present system, with the addition of drawing and some natural science. By it certain important lessons are taught, which, if not followed under the discipline of the school-master, run some risk of being entirely neglected. After this, probably the play-ground will be found more useful and much more popular with school-boys than trying to learn a trade by means of tools which, before he has to use them in earnest, may be thrown into the scrap heap. As a national question, the attention of the Government, imperial or municipal, ought to be directed to the importance of establishing in all great manufacturing centres, institutions resembling that of the Physical College, of this city. I am strongly of opinion that the erection and maintenance of colleges of science should not be left to the accidental liberality of the few, but should be taken in hand by the nation at large."

"Cold Short" Iron Described.

During litigations in a boiler explosion case in Toronto, Ont., recently, a number of experts were examined on "cold shortness" of iron. A broken rivet from the exploded boiler was shown in the court, and from the appearance of the fracture the experts said, under oath, that the iron in the rivet was "cold short." Mr. W. Raub, an eminent mechanical engineer, who was employed by the defense, stated before the court that no person oculd tell the quality of iron by the fracture unless he saw the fracture. Mr. Raub secured a bar of best brand of Lowmoor iron, took it to a blacksmith shop, cut a nick about one-eighth of an inch thick all around it, tapped it gently with a small hammer for about an hour and then hit it hard with a sledge. It broke off "as short as a carrot." He then turned the other end over, after nicking it, and, of course, the fracture showed a beautiful fiber. The "short" end of the bar was first shown to the experts, who one and all said it was "cold short," but when the other end of the same bar was shown to them they were dumbfounded. Mr. Raub had, by his light tapping, completely crystallized the one end of the bar and had left the other intact.—[Iron Industry Gazette.

SOME conception of the new tin industry of the Black Hills may be formed by what a single company is now doing. Myron Willsie, superintendent of the Harney Peak Tin Co., Lead City, Dak., owns some 300 lode claims, many of which are from 200 to 400 feet deep. This company has lately erected four large hoisting rigs with pumps, air compressors, drilling shops, and is now building a concentrating mill of 500 tons daily capacity. There are now 300 men on the pay roll, and the number is constantly being increased. The tin mines of Europe are from a few inches to a few feet in thickness, rarely exceeding 5 feet. Some veins of the Black Hills are 100 feet thick. This company will soon be able to supply the United States with tin, and the amount consumed now amounts to $30,000,000 anually.

A PARAGRAPHER who wanted to get off a joke at the expense of the English syndicates who are investing so much money in the country, recently intimated that the Pennsylvania iron makers are unloading their plants upon these Englishmen so as to raise money to establish new and better paying plants in the South. Recent events would go to show than this statement is more real than funny, particularly as to the iron makers of Pennsylvania investing in the South. Things spoken in jest oftentimes turn out to be serious actualities.—[Manufacturers' Record.

A SUCCESSFUL experiment in the operations of a ponderous 14-ton machine, built to fashion steel railroad ties, was made at Pittsburgh, October 7. The machine was set in motion at the mills of Carnegie, Phipps & Co., and from a three-quarter inch steel plate finished ties were turned out at the rate of 80 per hour.

AMONG the popular scientific articles to be published in the *Century*, during the coming year, will be reports of the latest studies and discoveries made at the Lick Observatory, in California, furnished by Professor Holden.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MENOMINEE RANGE.

Messrs. A. E.Guensburg, of Florence, Wis., Mr. Lustfield, of Crystal Falls, M. St. Peter, of Iron River and others, are vigorously prosecuting exploratory, work on the Michigamme River, nearly opposite the Caledonia. They have a large gang of men at work, and are sinking a working shaft, which will probably attain a depth of 40 or 50 feet, when a drift will be started toward the river, it being the intention to go underneath the river bed. The gentlemen are sanguine of striking the east end of the Caledonia vein, test-pitting already demonstrating that they are on the right track.—[News.

J. H. Parks, for Milwaukee parties, has secured an option on the northeast quarter of the southeast quarter of section 19, 43-32, being the old Youngstown mine. A force of men is now engaged in testing the depth of surface with a view to stripping. Cady Hollister superintends the work. This end of the Youngstown mine has not been worked for a number of years; the work being confined to that part of the mine known as the Nelson, on the northwest quarter of the southeast quarter of section 20 adjoining; the ore in that end being in a larger body and easier of access. The Youngstown folks gave up its lease on section 19 some time ago, and shortly after the Lœffelholz Mining Co. secured an option and did a little work. There are three working shafts and an open pit on the section. No. 1 shaft is 600 feet west of No. 4 (Nelson), is fifty feet deep and was sunk in rock, but a cross-cut showed a 40-foot vein of ore on the north and 20-foot vein on the south of it, the veins being separated by twenty-four feet of rock. The open pit, 185 feet west of No. 1 shaft, is worked out to a depth of about sixty feet and is about thirty feet wide. A drift eighty-five feet long runs from that pit, in the north vein, towards No. 1 shaft. No. 2 shaft is 100 feet south of the pit and is ninety feet deep. Two rooms are worked out here, one south and one west of the shaft, each about 30x30 feet; the vein is from fifty to sixty feet wide. This ore is particularly adapted for making a high grade of mill and forge iron and is a mixture for making an iron similar to the improved Scotch pig iron. The ore is quite free from moisture and is a very clean deposit. There is yet a large amount of ore in the section nineteen end of the Yonngstown, and it can very be easily taken out, when the proposed stripping is done. The option holders will also do considerable exploratory work in connection with regular mining, it is said.—[Mining News.

MARQUETTE RANGE.

The East New York expects to ship 35,000 tons of ore this season.

It is estimated that the Braastad mines will close the season with an output of 150,000 tons.

The *Mining Journal* says an adjustment of the disagreement between the Iron Cliffs and Artic iron companies relative to properties on the East Negaunee range, in the mineral right on which the companies named are joint owners, has finally been effected, and under the terms of the understanding arrived at, J. L. McClear, of Negaunee, will act as the agent of both companies for the purpose of granting options on the lands for exploratory purposes. Several applications for options have already been received, and it is certain that a great deal of exploring will be done in that quarter in the immediate future, now that the obstacle which has for so long retarded the development of these properties has been removed.

Owners of several Michigamme prospects have made such sales of ore that they have arranged to work them upon an extensive scale. The ore, like others of the Beaufort range, operates splendidly in furnace, and is desired by furnace-men if the price is right, and by working them energetically, they believe they can suit purchasers as to this important item. The stores of ore are very large here, and can be cheaply extracted. The mines are three in number, located as follows: Fowle's option embraces the south half of the southwest quarter of section 23, town 48, range 31, owned in fee by the Michigan Land & Iron Co. Two rows of test pits, seven in each row, show a deposit of clean ore 60 feet in width by 600 in length, the analysis of ore giving from 56.82 to 60 per cent. in iron, and from .148 to .19 in prosphorus. There is a railroad line graded to the mine upon which steel can quickly be laid. Immediately upon the west of this is the Ohio, occupying the south half of the southeast quarter of section 22. The ore has been found for a length of several hundred feet and for a width of from 40 to 80 feet. Two shafts on the foot-wall side have been started, 300 feet apart. The ore is similar to that of the property on the east. The Norwood sent out 5,753 tons of ore, last season, and is in a more advanced state than its neighbors. The ore has been shown to be 200 feet wide here, and thus far proved of a length of 600 feet. Two shafts have been sunk, and the mine can soon be made to yield a large product. The royalty on the ore is low, from 15 to 20 cents per ton, and it is the aim to operate the properties on a large scale, so that a fair profit should be obtained. Work will be commenced at once.—[Iron Ore.

GOGEBIC RANGE.

The large new working shaft, at the Federal, guarantees an increased output next season.

The Ruby, formerly known as the Puritan, is being thoroughly developed and will be in good shape for next season.

Five weeks more will, in all probability, bring the end of the shipping season from this range, by way of the lakes.

Work at the North Pabst has been temporarily suspended, while additions and improvements are being made to the plant.

There is no donbt that the Valley mine, which has been idle during the past two years, will be thoroughly explored next year.

Considerable development work will be done at the Anvil during the coming Winter, and larger shipments than ever are looked for in 1890.

The *Mining Journal* received a dispatch from its Bessemer correspondent, announcing that the Colby mine had closed down, and that future movements at the mine are a subject of much conjecture at that place, no one having any idea of what the purpose of the owners regarding the property is. The mine has had rather a checkered career latterly. It ranked among the great producers of the Lake Superior region for three years, its output exceeding 200,000 tons in 1886 and 1887, and crowding 300,000 in 1888, but since the owners resumed control (during the three years mentioned it was operated under a short-term lease) about a year ago, it has made but an indifferent record. The *Mining Journal* believes that the mine is all right, if properly handled, but the remarkable falling off in its output this year, together with the repeated hitches in the work there since the owners took charge of it, has created a very general impression that the Colby has seen its best days.

According to the *Pick and Axe*, last week was perhaps the most important in the history of Bessemer and the portions of the range directly tributary to it of any like period since the original discovery of the mammoth deposit of ore at the Colby. At the Dangler, occupying the west hall of the northwest quarter of section 13, immediately adjoining the Anvil property on the east and just a mile east of the city limits, a magnificent deposit of ore was entered by the diamond drill the close of last week and has been penetrated, horizontally, to a distance of nearly 50 feet without as yet reaching the hanging wall. This property was somewhat superficially explored, some two years ago, by the "East Anvil" company, but not meeting with the desired success, the work was abandoned, much against the judgment of Capt. John Humble who was prosecuting a cross-cut north from the foot wall with, as he believed, every prospect of shortly reaching a body of ore. It was by running the drill in horizontally at the end of this cross-cut that the ore was now discovered. The importance of this find consists not alone in the fact that it will add another producing mine to the list, but because of the encouragement it will give for further exploration on this portion of the range. There has never been any satisfactory reason for believing that the iron "vein" suddenly terminated at the Anvil mine, except that with such superficial exploring as has been done, no large deposits had been found between that and the Brotherton. It is now demonstrated that the ore is there and that it requires only capital and intelligent, persevering effort to locate it.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior, for the season of 1889, up to Wednesday, October 9th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	14,063	Grand Rapids	5,007	Prout	5,550
Barnum	4,666	Hartford	566	Queen	48,618
Braastad	85,485	Humboldt	13,667	Republic	242,271
Bristol	6,836	Jackson	45,841	Republic Reduction Co.	19,849
Buffalo	34,138	Jackson, pit 7	12,576	Riverside	3,712
Buffalo, South	2,774	Jackson, pit 8	22,108	Salisbury	19,059
Cambria	50,944	Jackson, South	15,502	Salisbury Bessemer	27,996
Champion	168,812	Lake Superior	48,459	Samson	449
Cleveland	188,944	Lillie	27,824	South Buffalo	49,163
Cleveland, Hematite	48,724	Lucy	15,953	Superior	115,522
Cliffs shaft	104,272	Marquette	56,848	Superior, Hematite	74,024
Curry	14,823	Marquette Ore Co	4,148	Volunteer	39,638
Detroit	5,564	Michigamme	31,237	Webster	117
Dexter	3,895	Milwaukee	46,967	West Republic	1,484
East Champion	2,697	Negaunee	63,783	Wetmore	15,885
East New York	17,261	North Champion	7,109	Winthrop	19,618
Edison	893	Pitts. & L. Angeline	189,600	York	12,844
Total, Marquette Range					2,053,730

MENOMINEE RANGE.

Aragon	613	Half & Half	4,059	Norway	61,859
Armania	37,248	Hamilton	7,362	Paint River	21,839
Chapin	401,237	Iron River	135,720	Perkins	9,652
Commonwealth	79,742	Ludington	85,206	Shafer	4,931
Cyclops	28,516	Mastodon	48,464	Sheridan	504
Dunn	113,592	Mastodon, South	2,094	Sturgeon River	4,775
Florence	134,590	Millie	10,527	Vulcan	132,336
Great Western	30,423	Monitor	7,403	Walpole	9,616
Total, Menominee Range					1,371,295

GOGEBIC RANGE.

Anvil	32,371	Iron King	37,333	Pence	68,217
Ashland	200,715	Ironton	6,740	Ruby	8,079
Aurora	157,602	Montreal	7,721	Section 33 south	37,485
Brotherton	52,700	Norrie	481,250	Sellwood Colby	23,230
Cary	40,648	North Montreal	24,610	South Colby	44,803
Colby, Beaver	35,132	North Section 33	18,456	South 15 Colby	10,221
Germania	57,338	Odanah	4,334	Windsor	13,412
Globe	9,814	Pabst	81,541		
Iron Belt	39,883	Palms	9,960		
Total, Gogebic Range					1,533,600

VERMILION RANGE.

Chandler Mine	266,754	Minnesota Iron Co.	445,798	Pioneer	3,144
Total, Vermilion Range					715,696
Grand Total					5,674,321
To corresponding date of 1888					3,673,885

Ore went forward at quite a lively rate during the week covered by the shipping report, the total quantity shipped by water from the Lake Superior mines reaching the very respectable figure of 212,881 gross tons. This is over 50,000 tons above the output of the mines for the corresponding week last year. The total for the season is now 2,000,436 tons beyond the shipments at the same date last year.

The Big Rivals:—

The Norrie had shipped 481,350 tons of ore, by water, at the date of closing the report for the current week, and continues to head the list. The Chapin is a good second, with shipments aggregating 401,237 tons—unless the product of the Minnesota Iron Co.'s Tower mines are to be considered as of a single mine, in which case that company would be entitled to rank next the Norrie. All the big mines are doing splendidly this year, but the Norrie is making a marvelous record as a producer, taking its age into account.—[Mining Journal.

THE Canada Iron Furnace Co., Montreal, has been incorporated with a capital stock of $200,000. The purposes of the company are the manufacture of iron and steel, and dealing in them; to operate coal and iron mines, timber limits, furnaces, foundries, rolling mills and steel converters; the manufacture of charcoal and its products; the dealing in wood and the products thereof, as well as all matters arising out of the aforesaid industries.

THE BEST THAT CAN BE SAID FOR THEM.

That *The Iron Trade Review* may not be charged with a willingness to give only one side of the pig iron warrant question, we republish herewith, at the request of the New York Metal Exchange, the following essential points of a recent article in the New York *Financier* on the subject referred to:

The admission of pig iron warrants to dealings on the New York Stock Exchange is an important advantage to the pig iron trade of this country, and will do much to energize it and promote its true interests. The wonder is that this had not been done long ago, for the production of pig iron in this country is a large industry, employing millions of dollars of capital and thousands of men, with an annual product of some 7,000 000 tons, with a market value of $125,000,000. That such a necessary product as pig iron, and of so large a yield and value, had no proper dealing status on the great exchange, or indeed on any leading exchange, indicates a condition of primitiveness not flattering to the business intelligence of the times. The absence of the proper facilities for dealing in pig iron as in other leading products of the country, through the medium of exchanges, is doubtless one cause of the unsatisfactory condition of the iron business at frequent intervals during the past decade. Producers of pig iron have felt the disadvantage of their business under the old system, which kept their product so alternating between briskness and dullness, for want of facilities of making it negotiable and capable of being carried, that there was no satisfaction and but little profit in the business.

This acceptance by the New York Stock Exchange of warrants as good delivery for any of its dealings in pig iron, is a just recognition of this valuable collateral, and capital will operate in these warrants with the same confidence that it embarks in the best class of securities. The financial advantage of the action of the Stock Exchange will be of immense value to the pig iron interests of the whole country. It would be hard to over-estimate this advantage to the pig iron interests represented by these warrants, and pig iron that heretofore has been hard to handle as a security, will now move with all the ease and convenience of any commercial commodity, when represented by these perfectly safe certificates; indeed, from the intrinsic safety of iron, these warrants can challenge any security known, for pig iron does not deteriorate from age, nor evaporate or lose weight from any cause; neither does it change quality; it cannot be stolen or be destroyed by mob violence and requires no insurance. It is nearly as low at present price in New York as it has been in 65 years, yet it has gone nearly five times higher, and though we produce one-third of the pig iron in the world, yet we import some 2,000,000 tons of iron and steel, simply because hitherto our home furnaces had no proper aid from capital in carrying their product. But thanks to the warrant system this will be no longer the case, the warrant will enable a stock of iron to be safely and cheaply carried, and the trade relieved from the disadvantages that have depressed and discouraged it in times past.

The pig iron interests of the country are to be congratulated in having their product placed on this excellent footing through this well-considered and carefully arranged system. The listing of these warrants will open up a large line of dealing for firms engaged in the iron trade, and doubtless largely increase the business of iron commission interests, provided they utilize the facilities that this improved, more economical, more satisfactory and more convenient systems of the warrants afford. To producer, consumer, operator and dealer, this warrant system brings advantages that use and acquaintance will more fully prove day by day.

Pig iron now is free from many disadvantages that depressed it in the past and promises greater prosperity in the future, and this warrant system embodies in its certificates the best security in convenient form and of readiest negotiability.

With judicious progressiveness the Stock Exchange, and other exchanges, have admitted various issues of industrial shares of leading lines of business in this country, and, while objection has been raised to some of these corporations from their being trusts and their not giving proper statement of their condition, and hence engendering distrust, yet no objection to these iron warrants can be raised on either of these grounds, for there is no trust in their case and there is no concealment as to what they are or as to what the company isuing them is. They are simple, plain certificates of deposit of pig iron at stated furnace yards, issued by a responsible corporation of experienced, reputable and successful business men, and the fact of admitting such warrants to be dealt in on the Stock Exchange is an endorsement by the strongest financial body in the world of their reliability and correctness in all respects. The prime purpose of the Warrant company is to enable pig iron to be produced with best facilities and handled with greater advantage and convenience through the medium of its simple and economical system, and thus to give stability and satisfaction with fairly remunerative profits to the iron trade, bringing about such a condition as to insure steady work and comparatively steady prices in this important commodity upon which so much capital and so much labor is dependent. Under the old system no proper stock of pig iron was possible, and the supply on hand often was not above a two weeks' consumption. The result was that large orders were driven into foreign markets, and what we should have filled at home, was bought abroad at the expense and to the detriment of our home interests.

Under the warrant system a supply of iron for a year or longer, can be easily carried, and thus fair competition be established with foreign markets, under which we can hold our home trade and gradually carry our iron to their markets and bring back their gold, instead of having them bring in iron to us and take out our gold. In short the success of the warrant system, which is now practically assured, means another addition to the proud edifice of the productive independence of the United States.

The consumption of native iron is now about 95 per cent. of the production, so that the carrying of this small excess of, say, 350,000 tons of a market value of $6,500,000, is a mere bagetelle to the capital of the country, and operated through the Exchange; indeed, carrying a whole year's product of $125,000,000 would be insignificant, when we consider that railway securities of $9,000,000,000, or seventy fold this annual iron product, are carried at a cost not exceeding four per cent. of their value, so that there is no burden to capital in carrying such amount of this good security in the shape of these warrants.

Alleged Fraudulent Stamping of Boiler Plates.

An esteemed correspondent, who knows whereof he affirms, sends us the following account of a boiler explosion, which seems to be a case for prosecution by the District Attorney of Philadelphia. Any one who supposes, however, that this functionary will bother himself to do so, cherishes an illusion:

"On July 30, 1889, two lives and $10,000 were lost by a boiler explosion in the Freeland Mills, Manayunk. At the coroner's investigation the engineer said that the explosion was unexplainable, as the boiler had been inspected and was allowed 80 pounds per square inch. At the time of the explosion (between 12 and 1 o'clock) the fires were banked, and the steam gauge showed 75 pounds. The boiler was known as a 'two-story' boiler, main shell 60 inches in diameter and 15 feet long, containing 52 flues, 4½ inches in diameter. The top boiler was 48 inches in diameter and 15½ feet long, without flues, the two being connected by four necks, 15 inches in diameter and 10 inches long. Although the sheets were stamped 'C. H. No. 1, 50,000 T. S. Flange,' by actual test the plates showed a tensile strength of but 28,729 pounds; elongation, two per cent.; reduction in area, two-tenths per cent. From the above you will see that there was nothing mysterious in regard to this explosion. The chief boiler inspector of Philadelphia is quoted as per his evidence 'He found the boiler was broken in four pieces, an unusual thing. * * * The cause of the explosion he attributed to the defects in the iron. *These defects would not be known by the manufacturers.*' (The italics are my own). The jury rendered a verdict that deaths were due to injuries accidentally received by the explosion.

"It is evident that there is something back of this. The boiler showed that the iron was bad by a test made of the iron; the iron was stamped to represent the best material.

"If these defects could not be known by the manufacturers, how could they know it was 'C. H. No. 1, 50,000 T. S. Flange,' and so stamp it?

"The coroner should have asked how it came to be stamped. No doubt the quality stamped was asked for, or they would not have so stamped it. As a general thing in explosions of this kind, all the blame is put on the boiler maker. Here is a case in which the manufacturer is the one who is to blame, but he goes scott free."—[The Engineer (New York).

International Analyses of Iron and Steel.

In a recent report to the State Department of the proceedings of the Society of German Iron-mining Engineers and Manufacturers, United States Consul Partello, of Duesseldorf, says: The British Association for the Advancement of Science some days ago appointed a commission for the best method of making international rules and regulations for the analyses of iron and steel. The committee were directed to enter into negotiation with other foreign committees of the same nature in order to receive and examine normal samples of iron and steel, the chemical compositon of which is to be carefully determined and defined. These samples, as before decided, are to be delivered at an appointed place, and are to be referred to when decisions are to be made in reference to analytical methods and use of such material.

Professor Langley, of the Michigan University, was requested to superintend this matter of samples, and to have samples sent to the respective associations in the United States, England, France, Germany, Switzerland, and Sweden, samples not to be sent to more than seven chemists of the abovenamed countries. If the results of the analyses of these samples are sufficiently harmonious, the average of the results of the analyses shall be accepted by all as the normal composition. It was decided that on the whole 150 kilograms of the samples selected as normal are to be prepared, making about 5 kilograms for each of the five interested countries.

It was claimed that the endeavors of the British association were of the greatest importance, as there is great need of uniformity in methods of examining and making analyses of iron and steel, and the international trade in steel and iron would be greatly benefited by such harmonious methods. Many questions and doubts are entertained by the society as to the efforts of the British associations, but progress must nevertheless be admitted.

Ship-building on the Pacific Coast.

A writer in *Proceedings of the Naval Institute*, says:

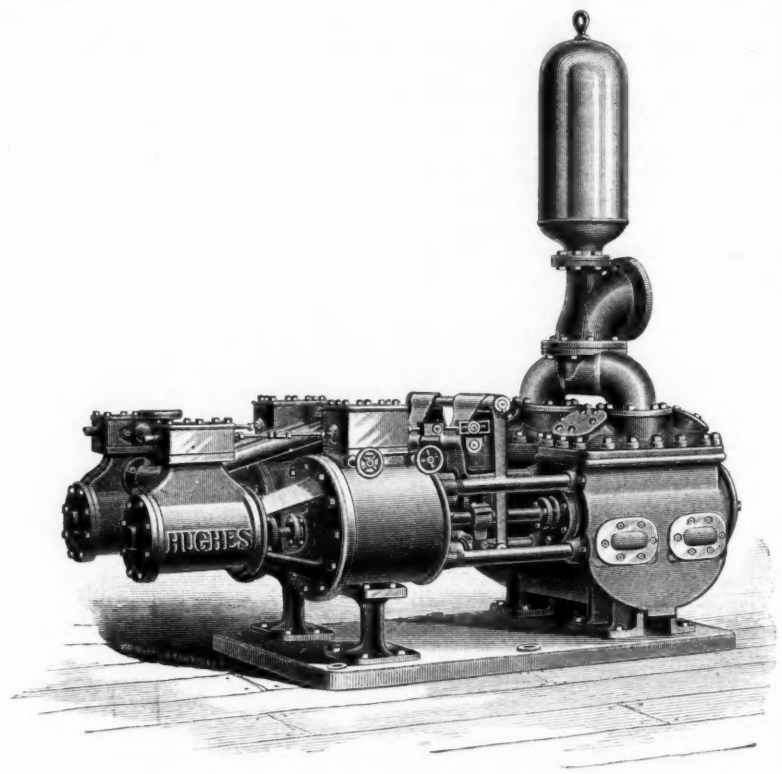
"In 1876 the specifications for the iron steamer *Meteor*, to run on Lake Tahoe, Cal., called for a speed of 20 miles per hour. She was built and launched that year at Glenbrook, on the Lake. The engines were built at Marysville, Cal., and all material and machinery were teamed over the mountains. There was no previous record of a vessel's steaming 20 miles per hour. The *Meteor* is 64 feet 6 inches long, with 10 feet beam, and a draught of 5 feet aft and 3 feet 1 inch forward, and a depth of hold of 5 feet. She is of 19 5 tons displacement, with fuel and 12 passengers on board, and is divided into water-tight compartments. The boiler is of steel, locomotive type, and carries 150 pounds pressure. The engines are one pair inverted cylinders, 10 inches diameter and 12 inches stroke, and weigh 2,600 pounds with all fittings, The propeller is of brass, three-bladed, and finished all over. The *Meteor* made 21 miles per hour, repeatedly, over a measured mile, and from Glenbrook to Tahoe City she made 12 miles in 38 minutes, or 18.9 miles per hour. The engines made between 270 and 280 revolutions, and were designed and built by W. R. Eckart."

We presume the writer means vessels of the *Meteor's* dimensions had never made 20 miles per hour previously.

COKE requires one-third more air for combustion than coal.

THE HUGHES STEAM PUMP.

The Hughes Steam Pump Co., of Cleveland, a type of whose pump is herewith illustrated, are at present working day and night, with a large force of men, being pushed principally on some water works pumping engines. They have this year built several large pumps with very gratifying success and have now orders for one pair of compound duplex pumps, 10x18½x10¼x12, for Albion, Mich.; also one pair for Wyandotte, Mich., 12x18½x12x18; also one pair of special compound elevator pumps for the Plankinton building, Milwaukee. They have lately started a complete pumping outfit for the *Pioneer Press* building, St. Paul, Minn., and have shipped two pressure pumps to Natchez, Miss., one 16x24x12x18, one 24x12x18. They have also started one 20x14x18 for the Cuyahoga county court house, this city. There is one under way now for the Hollenden Hotel, this city, 16x12x18, for elevator duty, together with a large number of regular sizes for boiler feeding and fire duties. With their present outlook they will be kept very busy for many months to come.



THE IRON INDUSTRY OF CHINA.

United States Minister Denby, of Peking, in a recent report to the Department of State, says:

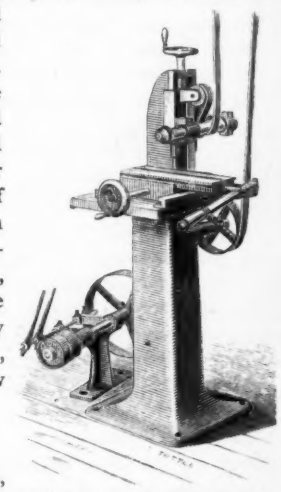
"I have the honor to enclose an imperial decree commenting on the late proposal of the viceroy o Canton to develop the iron industry in the two Kuang. In order to foster this important industry he has abolished the inland duties on iron and the prohibition against its export. He now proposes to investigate, by a commission, the subject of abolishing the heavy duty now levied on furnaces. Such a plan put into force for three years would not involve a large diminution of the revenue, but would greatly benefit the iron producers by doing away with illegal fees. He proposes also the creation of a joint stock company to work the foundries with foreign machinery. It would seem that the mind of this distinguished man, Chang Chi Tung, had undergone a change. He now, while still materially seeking to retain for his own people the benefits of industrial enterprises, favors the extensive use of foreign methods in building railroads and establishing electric lights and foundries. I do not doubt that the next process in his mental development will lead him to the only correct conclusion; that is to say, that foreign talent and honesty and will-power are indispensable to the successful introduction of foreign improvements."

The inclosure in Minister Denby's report is as follows:

"The viceroy of Canton states that iron is the chief mineral production of the two provinces within his jurisdiction. And yet for many years past there has been an immense consumption of foreign iron all over the country. Under these circumstances he considers it absolutely necessary that the native iron industry should be further developed, and with this object in view he has already procured the abolition of inland duties on iron and the removal of the prohibition against its export. A commission, which he appointed to investigate the whole subject in both provinces last year reports that the great obstacle to the extensive production of native iron is the heavy duty levied upon furnaces. Of these there are three kinds: Government furnaces, which pay each 53 taels a year to the financial commissioner; local furnaces, which pay an annual fee of 5 taels to the salt commission; and unlicensed furnaces, which pay nothing at all. It is now proposed that all distinctions should be abolished, and for the period of three years no tax should be levied upon furnaces of any kind. This will only involve a diminution in the revenue of something less than 2,000 taels, but the gain to the iron producers will be much larger than is represented by the above sum, for the exemption of the furnaces from all Government taxation will necessarily imply the discontinuance of the illegal fees which have hitherto been exacted, and which have proved the real hinderance to the development of the trade. A scheme is under consideration for the establishment of a joint stock company to work the foundries with foreign machinery, and great results are expected from the adoption of foreign methods of smelting, which are now receiving careful attention. If only the native industry can be stimulated and the consumption of the foreign article gradually checked, all classes of the community will benefit by the change, and no regret need be felt for the small sacrifice of revenue which it will for the present entail. The viceroy's views on the subject have received the cordial approval of the governor of Kuang-Si, and the memorial is presented in their joint names."

A NEW DIE GRINDER.

This is a very handy and desirable tool, designed particularly for use in connection with punch presses for grinding and sharpening dies, punches, etc. It is also well adapted for general use as a small surface grinder. The slide is traversed by hand, by means of the lever shown, which makes a simple machine and secures quick work. The spindle has a vertical screw adjustment and ample room is provided for running wheels of large diameter. The plan of belting this machine puts a loop in belt, which allows belting direct and dispenses with a tightener. The table has a transverse screw adjustment, and is provided with T slot for holding work. The surface can be ground at one setting, six inches by six inches. The machine weighs, complete, 350 lbs., and is manufactured by E. E. Garvin & Co., New York City.



Manganese Bronze.

As described by the inventor, Mr. P. M. Parsons, white bronze, or manganese bronze, is prepared by combining ferro-manganese, in different proportions, with various bronze alloys, thus producing qualities suited to various uses. The ferro-manganese is first subjected to a refining process, by which the silicon is eliminated, and the proportion between the iron and manganese adjusted in various degrees, for use according to the quality of bronze to be produced. To effect this combination, the temperature of the copper must be brought up to the melting point of the ferro-manganese, which is melted separately and then added in a fluid state.

The effect of this combination is similar to that produced by the addition of ferro-manganese to decarbonized iron in the Bessemer converter. The manganese in its metallic state, having a strong affinity for oxygen, cleanses the copper of oxides, and renders the metal more dense and homogeneous. A portion of the manganese is utilized in this manner, while the remainder, with the iron, becomes permanently combined with the copper, and plays an important part in improving and modifying the quality o the bronzes prepared from the copper thus treated, the effect being to increase their strength, hardness, toughness in various degrees, according to the quality and quantity of the ferro-manganese employed. Manganese, when once incorporated with the copper, is not driven off by remelting; the quality of the manganese bronze is improved by remelting.

Manganese bronze, as is stated, when forged, is remarkable for its strength and toughness, having an average tensile strength equal to mild steel, and elongating as much before breaking. It is suitable for forgings of all kinds, for bolts and nuts for engine and machine work, for ships' bolts, rudder, and other fittings, screws, pins, nails, pump-rods, wire, and for all purposes for which yellow metal, brass, and copper are employed. In forging this metal it should be heated to a clear cherry red (not bright), when it may be hammered, rolled, pressed, or worked in any way as long as it retains any color. It should not be worked at a black heat, but when the color is just fading it should be reheated.

In rolled sheets and plates it can be worked both hot and cold. In working hot, the instructions given for forgings should be followed. The metal can be rolled, stamped, pressed, and worked cold like brass or copper, being annealed as required. It is stronger, stiffer, and harder than copper, brass, or yellow metal, for which it can be substituted for purposes to which these are applied.

The rods, plates, sheets and angles are supplied of mild, medium, or high qualities, as required. The mild and medium qualities have a tensile strength of 28 tons per square inch (4,410 kgs. per sq. cm.), with an elastic limit at 40 per cent., and stretch from 28 to 45 per cent. before breaking. These qualities can be worked and riveted up cold, and are claimed to be greatly superior to yellow metal or gun metal.

When ships' screws are made of this material, they are given less thickness than when made of mild steel or of common bronze; it is not subject to alteration of form when taken from the mould or by the annealing which must be done with steel castings; it retains a clean surface remarkably well, but its cost is considerable.

Bids For Steel Cast Shells.

Bids have been opened at the War Department, Washington, D. C., for the supply of one hundred 7-inch and fifty 11-inch steel cast shells for the Ordnance Bureau. The bids were as follows: Standard Steel Casting Co., Thurlow, Pa., 7-inch shells $59.50 and $64.85 each; 11-inch, $127 and $137 each, (each size of shell being divided into two classes, with octagonal and round cavities respectively.) Midvale Steel Co., Philadelphia, 7-inch shells, 40 cents and 33 cents per pound; 11-inch shells, 37 cents and 30 cents per pound. W. H. Long, Goodhue & Co., Burlington, Vt., 7-inch shells $46.08 and $51.84 each; 11-inch shells, $132 and $145.20 each. The shells are to be delivered, one-third in 60 days, one-third in 75 days, and one-third in 90 days after contract.

PIG IRON WARRANTS ABROAD.

Since interest has been re-awakened in the subject of pig iron warrants, it will be instructive to learn from the *Iron & Coal Trades Review* (London), that there is considerable irritation over recent changes in the Scotch warrant system. Says the *Review* of October 4:

No small commotion has been created amongst the members of the Scottish Pig Iron Association, by the receipt of a communication from Messrs. Connal & Co., Limited, the well-known holders of pig iron stocks, intimating some important changes in the conditions attaching to the ownership of warrants on and after the 1st of January next. The warrant system in the Scotch iron trade has hitherto worked very smoothly, and with almost as much regularity as the movements of the planets themselves. By the new regulations, however, the owners of warrants will bear liabilities from which they are at present exempt, and it is all but certain that Messrs. Connal's action will deal a severe blow to the speculative purchase of warrants that is now so conspicuous a feature of the Scotch pig iron trade. According to these regulations, the rent on all warrants in circulation on the 1st of January next will be payable within twelve months from that date; in the case of warrants issued subsequently, rent will be payable within twelve months from the date of issue, and, failing such payment, interest at the rate of 5 per cent. will be added. These proposals, we understand, will be strenuously resisted by the Scottish Pig Iron Association, and as the matter is about to be fought out in the law courts, any comment upon the legality of the charges would manifestly be improper at the present moment. We may add, however, that as Messrs. Connal now hold over a million tons of iron in their stores at Glasgow, the 5 per cent. interest on unpaid rent-charge is likely to reach a very large sum at the end of a year. The practice hitherto pursued, we believe, has been for the holder of the warrant to pay the rent and other incidental charges on presentation of the warrant to the storekeepers—that is to say, when the iron is being taken out of store for consumption. Each warrant covers 500 tons of iron—"good, merchantable brand," but this quantity includes 300 tons of what are known in the trade as No. 1, and 200 tons of No. 3. In this connection we may remark that both these brands are now quoted at 64s. and 58s., respectively.

Parenthetically, we may also observe that in the pig iron warrant store which has just been opened in New York the warrant covers only 100 tons of iron—an arrangement which seems to have been specially designed to popularize the purchase, on speculative account, of iron warrants. As far back as May, 1875, an arrangement was come to by Messrs. Connal with the committee of the Scottish Pig Iron Association that in future the charge for delivery at Port Dundas of such South Side brands as Glengarnack, Eglinton, Dalmelington, Govan, and one or two others should be 6d. per ton. This charge has ever since remained in force, and has never been objected to, so far as we know, by the Association. Within the last few weeks, however, the committee, as the result of certain proposals made to Messrs. Connal, were conceded the privilege of additional free deliveries at Queen's Dock, Strobcross, Yorkhill and Clyde Villa wharves. A further concession was also made by Messrs. Connal reducing the extra for delivery to lighters at their Port Dundas wharf, of all the above named brands, to 4d. per ton. On the question of cartage to consumers, Messrs. Connal also agreed that extra should only be charged when the rate of cartage exceed 1s. 2d. per ton. Such are the conditions which Messrs. Connal & Co. now propose should govern the issue of warrants by them in future. It is understood that the principal reason why the clause has been introduced, making the rent payable each twelve months, or, in default, to impose a charge of five per cent. interest, is that under the present system warrants remain for a great many years in the hands of the trade. This clause, we believe, is in operation both at Middlesbrough—where Messrs. Connal hold about 176,000 tons of iron—and also in West Cumberland, where 384,000 tons are similarly held. Should the conditions now sought, by Messrs. Connal, to be imposed on the holders of warrants result in giving a check to the operations of speculators, the change would probably be welcomed everywhere with delight in the iron trade. The strong element of speculation, which has always existed in the Glasgow warrant market, has never been of advantage to the industry, while many times it has been a positive evil. Activity in the sale or purchase of warrants has, in fact, been rarely an index of the true state of the trade, and the tactics of the "bulls" and "bears" across the Border have, therefore, long since ceased to excercise any serious influence on the other centers of the iron industry throughout the country.

As regards the action of the Scottish Pig Iron Association in the matter, it is, of course, very easy to perceive that the Association, in opposing the new regulation, is fighting for a very important principle. The main ground of objection to the proposals, we learn, is that Messrs. Connal are acting *ultra vires*, inasmuch as no such stipulation with regard to the interest on unpaid rent-charge was made when the warrants were issued. It is to be presumed that, before deciding to make this novel charge, Messrs. Connal must have been assured that they were entitled to do so. The issue thus raised is of great importance to the members of the Scottish Iron Trade Association, and in resisting the innovation they are clearly within their right. The principle, as we have already stated, is by no means a new one, though this is the first time that an effort has been made by the warrant storekeepers to introduce it into Scotland. Whether Messrs. Connal are within their right or not in thus varying at their own will the conditions under which they are accustomed to issue the warrants, is a question which none but lawyers are competent to settle. At all events, the issue now has been definitely raised, and it is, perhaps, better that it should be submitted to a legal tribunal as speedily as possible.

A New Safety Valve.

A large number of safety valves have, of late years, been introduced by different firms constructed to open fully when the blowing-off pressure is reached, so as to blow off all the steam which the valve could possibly be capable of passing. In the majority of these valves, however, the great drawback is that they will not close again until the pressure has sunk considerably below the point of blowing off. Schaffer and Budenburg, of Manchester, have now introduced a valve in which this objection is entirely obviated, and whilst giving the fullest opening, the valve closes again promptly at the exact pressure at which it commenced to blow off. This end is attained by the arrangement of a kind of bell about the main valve, which has not a ground seating, but merely rests upon a slightly recessed surface forming a kind of seating. The steam acts upon the inner valve and upon an area which is simply equal to the diameter of this valve; but as soon as the valve has been raised the steam pressure acts upon an enlarged surface of this valve, which is then caused to rise within the bell, somewhat like a piston, causing the valve to open rapidly. The valve then raises the bell itself, allowing the steam to escape, and the escaping steam immediately throws up the bell, which is then suspended by the force of the escaping steam. It is evident that the valve will then close again against the original pressure, and after the valve proper has been closed and the steam ceases to escape the outer bell will also fall by virtue of its weight. The valve, therefore, opens and closes against the pressure on the area of the valve proper, whilst as soon as a small opening has taken place it is forced up with an additional pressure, which, however, is no longer exerted when the valve is closing.—[Iron and Coal Trades Review (London).

The Discovery of the Basic Steel Process.

A very bold, but, as the sequel proved, somewhat foolish attempt to deprive English metallurgists of the honor of having discovered the basic process of steel manufacture, was pretty effectually disposed of last week, at the meeting of the Iron and Steel Institute in Paris. In view of the wide publicity which has so frequently been given of the circumstances under which that extremely important problem was brought to solution, it is really amazing how such a claim as this could have been seriously put forward, least of all by a person of such eminence in the profession as M. Jordan. The incident is instructive, as it serves to demonstrate the very curious manner in which contemporary history is sometimes learned by the *literati*. Professor Jordan, in a paper read before the Institute, had the temerity to state that it was in the writings of Professor Gruner that Messrs. Thomas & Gilchrist got the first hint of a basic lining for their converters, and that the credit of the now famous discovery is therefore rightly due to M. Gruner. This preposterous assertion immediately brought Mr.Gilchrist to his feet, and after an emphatic denial by that gentleman that either he or his distinguished relative, the late Mr. Sidney Thomas, had ever read the writings of Prof. Gruner on the subject of the basic process, M. Jordan at once withdrew his assertion, and apologized for the error into which he had fallen. Sir Lowthian Bell, who certainly is as familiar with all the circumstaces of the case as anybody living, also bore testimony to the utterly groundless nature of the claim that had been set up by Prof. Jordan on behalf of a French chemist, and pointed out that a very long distance separates mere theory from practical demonstration.—[London Iron & Coal Trades Journal.

Road Engines.

Steam locomotion was first applied to road engines by Cugnot, as far back as 1765, but they have met with but little success. Cugnot's engine was a cumbersome machine, which only accomplished about four kilometres in an hour, as it had to be stopped and fed almost every quarter of an hour, and although some improvements were made from time to time in its construction, it was too unwieldy to meet with much favor. Railways were subsequently introduced, and from that time but little attention has been paid to road engines. Latterly, however, some interesting experiments have been made in the Ardennes with an ordinary three-wheeled vehicle transformed into a steam carriage, the weight being thus increased by about 20 kilos. for the boiler and 12 kilos. for the engine. This vehicle is capable of performing 20 kilometres in an hour over an undulating road comprising several steep gradients, and is, under all circumstances, perfectly under the control of the driver. In order to improve the grip of the wheels, without greatly increasing the weight, it has been proposed to apply articulated plates to the tyres, and a series of experiments is now being made with a view to testing the practicability of this system.—[London Iron and Steel Trades Journal.

Smokeless Powder in the German Army.

At the Imperial manœuvres of the German infantry recently, the good opinion formed regarding the new smokeless powder was considerably enhanced. A great deal of the powder was used by the Seventh Corps, and no smoke at all rose after the infantry had fired. The artillery were also provided with it, and when the guns were fired there was only a brownish grey, dustly-looking cloud, instead of the usual mass of smoke to be seen.

Large Hydraulic Press.

There has been constructed at the iron works at Croyet-Fourneyron, France, for the Lyons Arsenal, a hydraulic press which is believed to be the largest in the world. The bed plate on which the press rests is a solid mass of iron weighing 35 tons, and the weight of each of the columns supporting the top part (which is of steel, weighing nearly 12 tons) is 82 tons. The total weight of the press is given at 300 tons.

Personal.

Recent welcome callers at this office were William Kent, M. E., Secretary and General Manager of the Springer Torsion Balance Co., New York, and C. D. Dodge, Chief Engineer of water works, Lansing, Mich.

THE Minneapolis *Tribune* wants to know if all the Chinese laundry-men are members of the American Iron & Steal Association?

INDUSTRIAL SUMMARY.

New Enterprises :—

The Dunne Cutlery Co. has been organized at Portland, Me, with capital stock $50,000.

A stock company is being formed at Blacksburg, S. C., to build a large foundry and machine works.

The Edison Machine Works, of Schenectady, N. Y., have commenced the erection of large works. About 1,300 men will be employed in the new buildings.

Col. J. H. Sands and others have incorporated the Roanoke Iron Co., at Roanoke, Va, to build an iron furnace. Capital stock is to be not less than $150,000 nor more than $1,000,000. Mr. Sands is president: Henry King, of Alleghany, Pa., manager, and James W. Tyler, Washington, D. C., secretary and treasurer.

The Richmond Street Motor Co. has been incorporated at Richmond, Va., with Allen Talbott president, and William Simpkin vice-president and general manager, to manufacture motors for steet railways. The capital stock is to be not less than $50,000 nor more than $1,000,000. For the present motors will be made at the works of Simpkin & Hillyer.

Salem, Va., is to have a blast-furnace. The company have been incorporated as the Salem Furnaces and have been organized with the following officers: D. B. Strouse, of the Bonsack Machine Co., president; F. H. Chalmers, secretary; John M. Evans, treasurer; F. E. Bachman, superintendent. Board of Directors: C. M. Clark, of E. M. Clark & Co., Philadelphia; Chas. G. Eddy, vice president of the Norfolk and Western Railway; James A. Bonsack, F. E. Bachman, J. W. F. Allemong, T. J. Shickel, John M. Evans, F. H. Chalmers and D. B. Strouse. The contract for the furnace, 14½x75 feet, has been let to the American Bridge Co., of Roanoke, Va.

Recent Illinois incorporations:—W. C. Spofford Co., Chicago; to manufacture weighing scales; capital, $20,000; incorporators, W. C. Spofford, W. Rhodes, C. E. More.—The Chicago Malleable Iron Co. filed a certificate of increase of capital stock from $300,000 to $400,000.—Strasburger Refrigerator Co., Chicago; to do a general manufacturing business; capital, $20,000; incorporators, James H. Raymond, Irwin Veeder, Otto R. Barnett.—Fox Carbon Heating Co., Chicago; to manufacture heating apparatus; capital, $100,000; incorporators, Peter Fox, Bernard A. Eckhart, James Swan.—Munson Type-Writer Co., Chicago; to manufacture type-writers; capital, $60,000, incorporators, Samuel J. Seifreid, T. B. Harrison. Stephen Munson.

Special dispatches to the Baltimore *Manufacturers' Record* report the organization in London, Eng., of a large company to build iron and steel works at Middleborough, Ky., and the commencement of work at the same town on two furnaces of 150 tons daily capacity, each to cost about $400,000. In the last two weeks about seventeen or eighteen new furnace projects have been reported in the South and contracts have already been made for building about one-half of them, while a dozen or more are being organized and will shortly be made public. The sales of mineral and timber lands for the week, in large tracts, have aggregated, probably, half a million acres, while negotiations are pending for still larger bodies, including 300,000 or 400,000 acres of timber land in Mississippi and several hundred thousand acres in East Tennessee, the purchase of the latter by a $6,000,000 company having been virtually closed.

It is Geo. N. Gray & Co. The company part is the Hecla Iron Co. They propose to operate, together, Hecla furnace for the next three years. Possession is not given to the new company until next March, but Col. Gray, who will assume the entire management of the new concern, will give out the wood chopping right away. It is proposed to continue the production of the famous Hecla cold blast charcoal iron, and to increase the output to 20 or 25 tons a day. To accomplish this, Hecla Co. will immediately go to work to complete their new furnace. It is already so far advanced that they expect to deliver over to the new company a complete furnace by the first of next March. The buildings are complete, engines in place, fire-brick on the ground. The principal work to be done is setting up new boilers, lining the furnace stack and constructing an elevator. The boshes will be 10 feet, and very steep; the height of the furnace will be 50 feet. The present blast of old Hecla will continue till March 1, after which it will probably not run any more. The increased enterprise at Hecla will be of great advantage to all that region, and we hope to the proprietors, also.—[Ironton (O.) Register.

Enlargements, Additions, Removals, etc.:—

The Cameron Iron & Coal Co. are building a machine shop and foundry at Emporium, Pa.

The Richmond Locomotive & Machine Works, of Richmond, Va., have amended their charter authorizing the increase of their capital stock to $2,500,000.

The Moore Manufacturing & Foundry Co., of Milwaukee, Wis., will probably use their present foundry for a machine shop, and erect a new foundry building.

The new shop just finished by the L. W. Pond Machine Co., of Worcester, Mass., measures 200x40 feet, and is three stories high. An excellent light is obtained from large windows on three sides. The shop will contain many improved tools and will be lighted by electricity.

P. H. Laufman, the sheet iron manufacturer, at Apollo, said recently that he had just increased the capacity of his plant 50 per cent. This was done in view of the tariff being advanced high enough to compete with the English manufacturers. He stated that as soon as Congress passes the tariff legislation on tin-plate there will be half a dozen mills in this vicinity return to the manufacture of tin.—[Pittsburgh Dispatch.

The Southern Iron Co. has absorbed the Ætna Iron Co., the La Grange Furnace Co., the Warner Iron Co., and the Wayne County Iron Co. The capital stock is now placed at $10,000,000, and it is stated that they will expend $150,000 to $200,000 in remodeling the steel works at Chattanooga, to manufacture basic steel and also build two additional iron furnaces, one of which will be in Wayne county. It is stated that $3,000,000 of bonds and $6,000,000 of stock will be issued at once.

Work is progressing with the new furnace at Lawrence. The foundations are about completed. The work is being done by Fred Boss. The Waldreth furnace has been moved from West Virginia, and will be utilized in the building of the new furnace. The boshes will be 14 feet, and the height of the stack 65 feet. Some four or five months will be required to complete the furnace. When put in operation it will use native ore, and half native coal and coke, though the proportion of coal may be larger. Lawrence has a nice coal, quite suitable for smelting. There is every indication that the new plant will do good work and will be run in a way that will insure a steady and prosperou s business.—[Ironton (O.) Register.

Fires and Accidents :—

Rich & Vincent's foundry and machine shop at Fort Dodge, Ia., were almost totally destroyed by fire.

About six o'clock Monday night, fire broke out in the Tenth street mills of the Oliver Iron & Steel Co., on the South Side, Pittsburgh, and one of the main buildings was destroyed, entailing a loss of 200,000, which is partially covered by insurance. The burned building occupied the entire square between Tenth and Eleventh streets on Muriel. It contained the general offices of the company, a packing room, car shops, machine shop, blacksmith shop, press room and fitting room. The work of rebuilding the structure will be commenced at once, and it will be the same size as the old building. None of the other parts of the mill are effected by the fire and work will go on in them the same as before.

Noteworthy Contracts, Remarkable Records, Etc.:—

Witherow's Works, this city, recently received a contract to erect two blast furnaces, including boilers, engines, engine houses, boiler houses, etc., etc., in Virginia.—[New Castle (Pa.) Guardian.

The A. Garrison Foundry Co. of Pittsburgh, recently cast a very large roll, the dimensions of which are as follows: Diameter of body, 34 inches; length of body, 120; diameter of journals, 24; length of journals, 20; coupling ends, 20; diameter, 9. The weight of this roll is 40,000 pounds.

Messrs. John A. Roebling's Sons Co., after trying the Aerated Fuel Co.'s system on their wire furnaces for a month, have recently placed an order with W. S. Collins, licensee, 171 Broadway, New York, for seventy-two burners to fit up thirty-six of these large furnaces. Mr. Collins reports other important orders lately from old as well as new customers.

Furnace No. 3, of the Glendon Iron Co., Easton, Pa., Morris P. Janney, superintendent, turned out for the week ending September 28, 1889, 824½ tons of iron, chiefly gray forge, with 801 $\frac{12}{100}$ tons of fuel, one-fourth coke, three-fourths anthracite, giving a fuel consumption of 19 hundred-weight, 1 quarter, 22 pounds per ton of iron. No extra scrap was used. The furnace is 81 feet high and 18 feet bosh.

Williams, White & Co., Moline, Ill., have lately taken orders for a drop press weighing 13,000 pounds to go to Cleveland, and another weighing 8,000 pounds to Georgia, and will ship in a day or two a car load of machinery to California for one of the largest agricultural works in that state. They are erecting a 40-pocket automatic coal chute, Burnett & Clifton patent, for coaling locomotives of which they are the owners, for the Illinois Central Railroad Co., near Cairo, Ill.

Our (Newberry) furnace made 1,597 tons of iron last month, using 88 bushels of charcoal per ton. The ore yield was 53.1 per cent. The furnace had to stop five days on account of the scarcity of coal. This brings the average to 64 tons per day for running time. We think we can say, without any fear of contradiction, that this is the best work done by any furnace in the upper peninsula up to date. We shall not be at all surprised to see Supt. Jones turning out 70 tons per day on an average for next month. As the *News* stated a couple of weeks ago, the furnace is now doing the best work it has ever done before, and we feel confident that it will do still better in the future.—[Newberry (Mich.) News.

General Industrial Notes:

At Youngstown, O., the city council have advertised for bids to pave Boardman street, which is nearly a mile long, with asphalt.

It is said that negotiations are pending for the purchase of the Bass Foundry & Machine Works, of Ft. Wayne, Ind., by an English syndicate. It is said that Mr. Bass refused $3,000,000 for the property a year ago.

Carnegie, Phipps & Co., Limited, of Pittsburgh, will soon make some important improvements in their Homestead steel works, at Homestead, Pa. The most important will be the increasing of the size of rolls so that 30-inch beams can be rolled. This plant is being operated to its utmost capacity at present.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 30th day of October 1889, for improving and reconstructing the heating and ventilating apparatus in basement and first story of the U. S. Court House, Post Office, etc., at New York, N. Y.

The new automatic high-speed engine, built by the Bryant Safety Engine Co., of Rochester, N. Y., is somewhat of the character of the Shipman and Acme oil-burning engines. It has a cast iron sectional boiler, in which provision is made for expansion and contraction. A rocking valve is used. It has an ingeniously-arranged governor in direct connection with the connecting-rod, which renders the control very sensitive. The engine has given excellent results in service.

CONDITION OF THE COKE INDUSTRY.

The coke works of the Connellsville region are running as close to their full capacity as is practically possible. Every oven in the region, except such as are idle for wear-and-tear repairs, is in blast. As a result production is booming as it never boomed before, and all previous records have been eclipsed. But the boom can't last much longer unless the car supply improves, a contingency of which the railroads hold out absolutely no hope whatever. For the past couple of months the average excess production over shipments has been 900 tons per day. There are now about 45,000 ton, or 2,500 cars, of stock coke on hand. The yards will not hold much more than this. Ma y works are already blockaded to such an extent as to seriously interfere with their operation. The inevitable result will be a restriction of production commensurate with the car supply. Nothing short of a universal shut-down of one day per week will accomplish this, and such a shut-down must come within the next week or so and continue until such time as the railroads can increase their carrying capacity.

In the meantime many of the Western furnaces are short of coke, and some of them must eventually bank down. It is to be hoped that this necessity will not arise. It is pregnant with danger to future trade. Such a curtailment of pig metal production would have a tendency to push iron prices, already advancing at a pretty fair rate of progress, into the dangerously rapid pace which cooler heads are strenuously trying to guard against. Such an iron trade boom would involve a correspondingly extravagant advance in the price of coke, and this in turn would mean a glut of oven-building at home and abroad, with the evils of which coke operators are only too familiar. Such a condition must inevitably bring about a general slump in both iron and coke, which will affect the railroads quite as much as anybody else. It is, therefore, to be expected that the latter will put forth their best efforts to keep the coke trade moving. The lake coal trade ceases November 15th, but very little relief is expected from this quarter, as the grain trade is expected to absorb the cars now in the coal carrying trade.—[Connellsville (Pa.) Courier.

The Circulation of Water in Boilers.

The circulation of water in boilers is attracting more attention from engineers, and the importance of it is being more generally recognized. The best circulation is, of course, found in the plain cylindrical boiler, where there is nothing to interfere, and decreases with the number of flues added. Other considerations must enter into the matter of the economical generation of steam, but the circulation should not be forgotten. In tubular boilers, the best practice places the tubes in vertical rows, leaving out what would be the centre row. The circulation is up the sides of the boiler and down the centre. Tubes placed zigzag in boilers never give good results.—[Glasgow Engineer.

Enterprise

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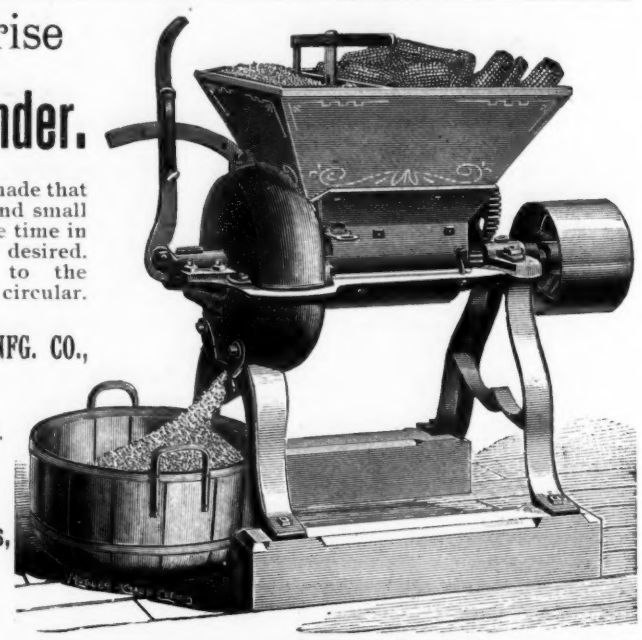

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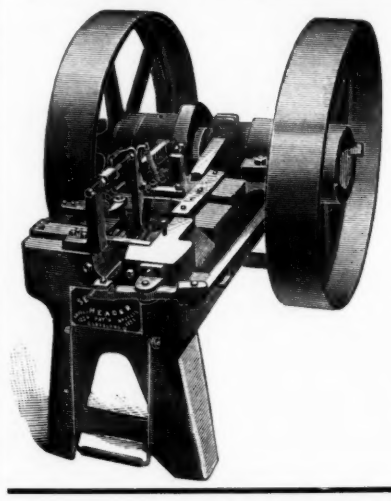

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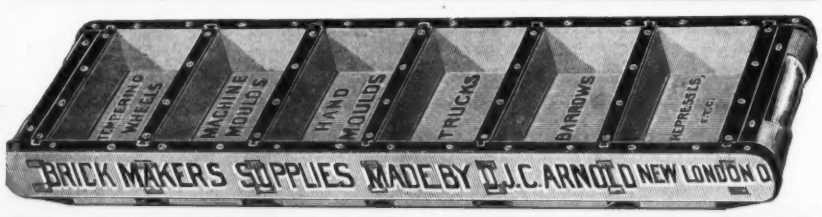

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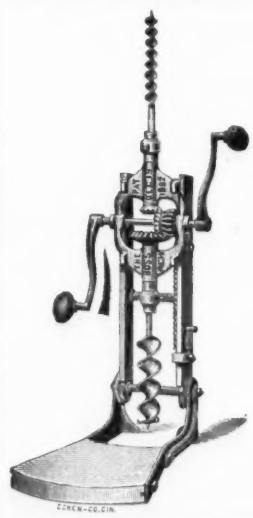

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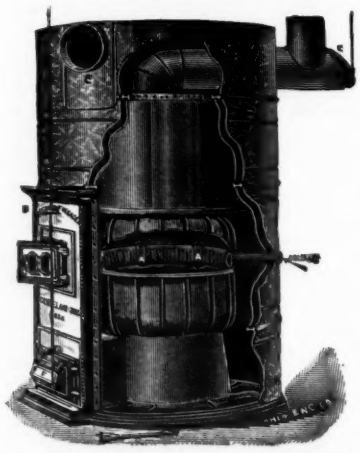

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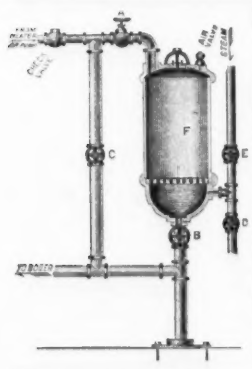

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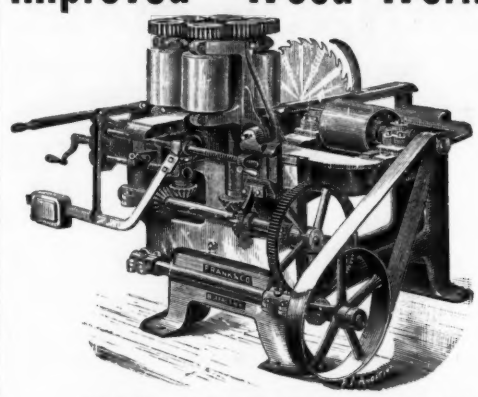

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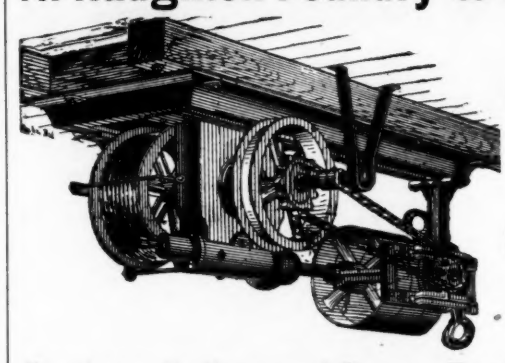

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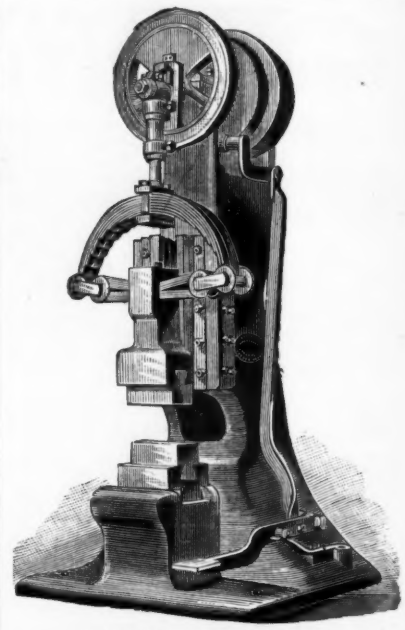

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CHICAGO (reported by Rogers, Brown & Co.): COKE AND BITUMINOUS—Southern No. 1 Foundry, $16 75@17 00; Southern No. 2 Foundry, $16 25@16 50; Southern No. 3 Foundry, $15 50@15 75; Southern No. 1 Softe er, $16 25@16 50; Southern No. 2 Softener, $15 25@15 50; Southern Gray Forge, $15 25@15 50; Southern Mottled, $14 50@15 00; Ohio, Jackson Co. Silveries No. 1, $18 00@00 00; Ohio Jackson Co. Silveries No. 2, $17 00@00 00; Hocking Valley Silveries No. 1, $17 75@18 00; Hocking Valley Silveries No. 2, $16 75@17 00; Norton Kentucky Silveries No. 1, $17 75@18 00; Norton Kentucky Silveries No. 2, $16 75@00 00; Ohio Strong Softeners No. 1, $18 25@18 50; Ohio Strong Softeners No. 2, $17 25@17 50; Hamilton, Hanging Rock, all ore No. 1, 18 25@18 25; Hamilton Hanging Rock, all ore No. 2 17 25@17 50. LAKE SUPERIOR AND SOUTHERN CHARCOAL FOUNDRY—Lake Superior Charcoal Nos. 1 & 2, $19 00@19 50; Alabama Charcoal Nos. 1 & 2, $22 00@23 00; Tennessee Charcoal No. 1, $18 50@19 00; Tennessee Charcoal No. 2, $17 5'@18 00. MALLEABLE AND CAR WHEEL—Lake Superior Charcoal Nos. 1 to 6, $19 00@20 00; Southern Alabama Nos. 1 to 6, $22 00@24 00; Tennessee Nos. 1 to 6, $18 50@19 50; Hanging Rock Warm Blast Nos. 1 to 6, $22 00@24 00; Hanging Rock Cold Blast Nos. 1 to 6, $26 00@28 0; Southern Cold Blast Nos. 1 to 6, 26 00@26 50.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and SouthernCoke No. 1, $15 75@16 25; Ohio and Southern Coke No. 2, $15 50@15 75; Ohio and Southern Coke No. 3, $15 00@15 25; Ohio Soft Stone Coal No. 1, $17 00@17 50; Ohio Soft Stone Coal No. 2, $16 00@16 50; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $17 50@18 50; Tennessee and Alabama Charcoal No. 2, $16 50@17 50. FORGE—Strong Neutral Coke, $14 75@15 00; Mottled Neutral Coke, $14 00@14 25; Cold Short Coke, $14 50@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $15 50@16 00; Southern Coke No. 2 Foundry (new classification), $15 00@15 50; Southern Coke No. 3 Foundry (new classification), $14 50@14 75; Grey Forge, $14 00@14 25; White and Mottled, different grades, $13 50@13 75; Silver Grey, different grades, $14 25@15 25; Southern Charcoal No. 1 Foundry, $17 00@17 50; Southern Charcoal No. 1 Mill, $15 50@16 00; Southern Car Wheel, Standard brands, $22 50@23 50; Southern Car Wheel, other brands, $18 25@21 25; Hanging Rock Coke No. 1 Foundry, $16 25@16 75; Hanging Rock Charcoal No. 1 Foundry, $21 25@21 75; Hanging Rock Cold Blast, $21 50@23 50; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $15 75@16 25; Southern coke No. 2, $15 25@15 75; Southern coke No. 3, $15 00@15 25; Mahoning Valley (Lake ore mixtures), $18 50@19 00; Southern charcoal, No. 1, $17 50@18 50; Southern charcoal, No 2, $17 00@17 50; Missouri charcoal, No. 1, $19 00@19 50; Missouri charcoal, No. 2, $18 50@19 00. FORGE—Neutral coke, $14 75@15 00; Cold short, $14 25@14 50; Mottled, $13 50@14 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 00@23 75; Southern (other brands), $18 50@19 50; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 25@16 75; Southern Coke No. 2, $15 75@16 00; Southern Coke No. 3, $15 25@15 50; Southern Grey Forge, $15 00@15 25; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $17 00@17 50; Missouri Charcoal No. 2, $16 00@16 50; Ohio Softeners, $18 00@20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $21 00@22 00; Southern, $19 00@24 00. CONNELLSVILLE COKE—East St. Louis, $5 00; St. Louis, $5 15.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $18 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $17 00 $00 00; Niagara No. 1, $18 25@00 00; Niagara No. 2, $17 25@00 00; Niagara No. 3, $16 50@00 00; Ohio Softeners No. 1, $18 50@00 00; Ohio Softeners No. 2, $17 50@00 00; Southern Softeners No. 1, $17 25@00 00; Southern Softeners No. 2, $16 50@00 00; Lake Superior Charcoal, $20 50@00 00; Tennessee Charcoal, $19 50@20 00; Alabama Car Wheel, $25 00@25 25; Hanging Rock Charcoal, $24 00@20 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 50@20 00; Lake Superior Charcoal, Bessemer, $20 50@21 00; Lake Superior Coke, all Ore $19 00@19 50; Lake Superior Coke, Cinder Mixed, $18 25@18 75; Southern No. 1, $18 25@18 75; Southern Gray Forge, $16 00@16 25; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $18 25@18 75; Old Wheels, $19 00@19 75; Old Iron Rails, 25 50@26 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $18 25@18 75; No. 2 Foundry, $17 25@17 75; Grey Forge, $16 50@17 00; White and Mottled, $15 00@15 50; Warm Blast Charcoal, $18 00@25 00; Cold Blast Charcoal, $24 00@28 00; Bessemer, $20 00@21 00.

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1½ to 4 by ⅜ to 1 inch	1 80
4¼ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1½ to 2 inch	2 20
1¼ & 1¾ by ⅜ to ¾ inch	1 90
1 & 1¼ by ⅜ to ¾ inch	1 90
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 30

Round and Square.

1 to 1⅞ inch	1 80
2 to 2⅞ inch	2 00
2¾ to 3¾ inch	2 30
3⅜ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅞ to 1¼ inch	2 20
⅝ to ¾ inch	2 40
½	2 60
⅜	3 00

Half Oval and Half Round.

1½ to 3 inch	2 90
⅞ to 1¼ inch	2 50
⅝ to ¾ inch	3 00
½	3 30
⅜	4 80

Heavy Band.

½ to 6 by ¼ and 5-16 inch	1 95
to 1⅜ by ¼ and 5-16 inch	2 05
¾ to ⅞ by ¼ and 5-16 inch	2 25
½ to ⅝ by ¼ and 5-16 inch	2 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 65
1¼ to 2, Nos. 16 to 18	2 75
1¼ to 2, No. 19	2 85
1¼ to 2, No. 20	2 95
1¼ to 2, No. 21	3 05
1¼ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 35
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	2 15
⅞, Nos. 19 and 20	2 25
⅞, No. 21	3 35
⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	4 05
⅝, Nos. 16 to 18	3 85
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 35

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅜ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 60
No. 15 to 17	2 80
No. 18 to 21	2 90
No. 22 to 24	3 00
No. 25 to 26	3 10
No. 27	3 20
No. 28	3 40

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 40
C No. 1, " "	2 65
C H No. 1 " "	2 90
C H Flange, " "	3 60
Extra Flange, "	4 00
Solid Fire Box, "	4 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 65
Shell	3 05
Flange	3 30
Marine Flange	3 80
Fire Box	4 45

Above includes plates 90 inches wide.

90 to 96 in. wide	½c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅝ thick	0

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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

Bessemer and O. H. Steel.

	ct. lb
Machinery	base price, 02¾
Tire	" 02¾
Spring	" 03¾
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$20 50
No. 1 wrought scrap	19 00
No. 1 Machine cast scrap	13 00
Pipes and Flues (clean)	23 00
Iron axles	24 00
Axle turnings	14 50
Wrought turning (free from cast)	13 00
Cast borings	9 00
Uncut wrought iron boilers	12 00
Steel boiler plates	13 00
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Wrought drillings	11 00
Malleable iron	9 50
	GROSS TONS
Old iron T rails	24 00
Old steel rails	18 00
Old car wheels	17 00
Old copper	¾ lb 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron.

Rooms 716, 717, 718, 719 Perry-Payne Bld'g

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J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore.

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CONDIT, FULLER & CO.,

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IRON ORE - -

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MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

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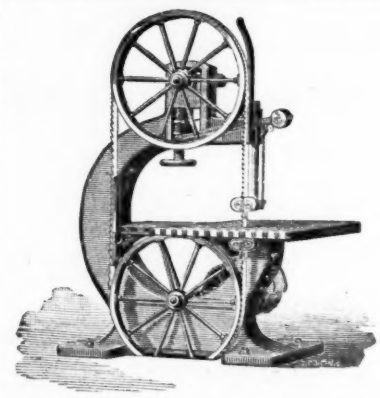

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$100 will buy our new No. 2 band saw.

$185 will buy our new patent band re-sawing machine.

$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw.

$125 our new No. 2 complete as above.

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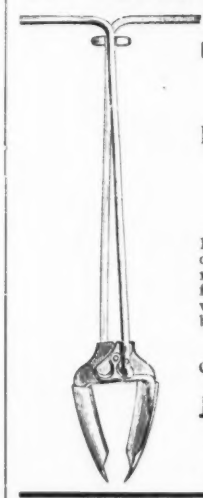

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LATEST AND BEST

on the market. This Auger

Bores Rapidly

AND IS

Easily Operated.

It will open wide when dumping the dirt, which may be entirely removed from the hole, whether wet or dry, fine or coarse, by closing blades.

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J. H. OSBORNE & CO.

Manufacturers,

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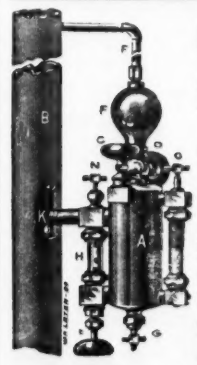

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Tests of Ores and Strengths of Material requiring expert work a specialty. Address,

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MACHINERY SUPPLY MARKET.

Anvils.

American ..... ℔ 9@10
Wrights ..... ℔ 9½

Bellows.

Blacksmiths' { Hill's ..... dis 40 / Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70@70& 5
" " " extra ..... dis 60&5@60&10
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single, ... dis 35&5
Shultz Raw Hide Leather Belting, double, and Light Double ..... dis 35&5
Standard, oak tanned ..... dis 55@60
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

B. F. Sturtevant's ..... dis 20
Boston Blower Co., ... dis 35
Buffalo ..... dis 35

Borax.

..... ℔ 9½@10½

Chalk.

White ..... ℔ gross 50
White Crayon ..... ℔ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 45
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers. ..... dis 25
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 30
" Independent ..... dis 40
" Little Grant Drill ..... dis 30
Horton's Universal & Ind ..... dis 40
National Combination ..... dis 40
Sweetland " ..... dis 40
Skinner " ..... dis 40
" Independent ..... dis 40
Almond Drill ..... dis 25
Morse " ..... dis 15
Skinner " ..... dis 30

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" " Gear Cutters ..... dis 15

Crowbars.

Cast Steel ..... ℔ 4
Iron, steel points ..... ℔ 3½

Drill and Drill Stocks.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1½" ..... dis 50&10
Morse Taper and Straight shank Larger than 1½" ..... dis 25
Drill Sockets ..... dis 25
Standard ..... dis 50&10
Cleveland ..... dis 50&10
Maneer's bench ..... dis 50&25
Maneer's post ..... dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ℔	4 c	5 c		2½c
½ kegs ℔	4¼c	5¼c		2¾c
¼ kegs ℔	4½c	5½c		3 c
10 ℔ cans, 10 in case	6 c	6½c		5 c
10 ℔ cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 40@46
H. H. Barton ..... dis 40@46

Emery Wheels.

Detroit ..... dis 50@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Union Stone ..... dis 60
Sterling ..... dis 60
Vulcanite ..... dis 15@20
Celluloid ..... dis 10
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 65@70
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 ℔s. 18c over 5 ℔s 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 ℔s, ℔ add ½c., 1℔ boxes add 1c to list.

Nails (wire.)

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ℔ keg card rate
{ Car lots $2.30
{ Less than car lots $2.40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co ..... dis 60
American Packing Hemp ..... ℔ 10@11
Russia Packing " ..... ℔ 14
Italian Packing " ..... ℔ 13@14
Plumbago Piston ..... ℔ 40
Morrison's " ..... ℔ 50
Square Flax " ..... ℔ 70
Sheet Rubber ..... ℔ 12@24
Excelsior Rubber ..... ℔ 48

Picks.

Railroads, 5 to 6 ℔s ..... $12 dis 60
" 6 to 7 ℔s ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 45

Rivets.

Iron, Thousand, list November 17, ... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ℔ 15¼
Sisal, ½ inch and over ..... ℔ 13¼

Sand Paper.

B. A. & Co ..... dis 40@40&10
H. H. Barton's ..... dis 40@40&10
New England Flint ..... dis 40@40&10
Barton's Garnet ..... dis 25

Saws.

Disston's Circular ..... dis 45
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Circular Saws ..... dis 50
" Mill, Mulay and Drag Saws .. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts .. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "
Detroit Saw Works, Circular ..... dis 50
" " " Band ..... dis 25
" " " Mulay ..... dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 55
Machine, round head, iron ..... dis 50
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ ℔ Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ ℔ Balls (Spring Twine)		11½c
3-Ply " 1℔ Balls		12@12½c
3-Ply " 1½ ℔ Balls		11@11¼c
Cotton Wrapping, 5 Balls to ℔		15@16c

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30
Maneer's machinist ..... dis 50&10

Wire.

New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 .. dis 70&10@75
" " Nos. 19@26 .. dis 75@75& 5
" " Nos. 27@36 .. dis 75&10& 5
Coppered Nos. 0 to 18, market list .. dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@℔ dis 30

Wrenches.

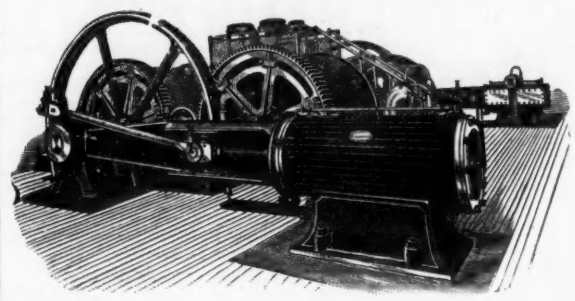
Coe's genuine, cash in ten days ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40

Sebastian, May & Co.'s

Improved Screw-Cutting FOOT or POWER LATHES.

Catalogue of Lathes, Dril Presses & Machinists' Tools and Supplies mailed on application. Lathes on Trial.
164 W. Second St., CINCINNATI, O.

Webster, Camp & Lane Machine Co.



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Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.
Wire Rope Haulage Machinery,
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CORNISH PLUNGER AND BUCKET LIFT PUMPS.
Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.
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We do Stamping and Pressing of Sheet Metals for all Classes of Work. Also Tinning, Galvanizing and Japanning. Also sole manufacturers of
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All sizes and kinds, with and without Axles.
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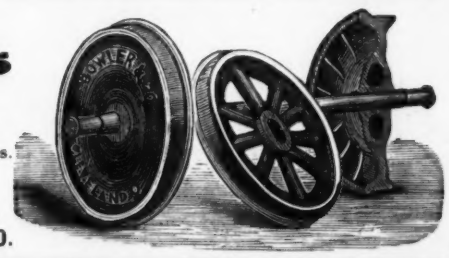

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True to pattern, sound, solid, free from blow-holes and of unequaled strength.
Stronger and more durable than iron forgings in any position, or for any service whatever.
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LEADER STEEL BARROW, NO. 6.

Write for Catalogue of all styles of Steel and Wood Barrows, Hand Carts and Warehouse Trucks.
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LANSING, MICH.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 25@6 75
Others.....₩doz. $5 75@6 00
Full polished.....$8 25

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10

Sargent's list
Carriage, common, new list.....dis 75&7½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 80
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb 5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable, ₩ lb.		23	24	25	26	28	dis 25&10@25&10&10
Putnam, ₩ lb.		18	19	20	21	23	dis 15
Essex							dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Pash plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers.dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $5 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

Steel and iron } dis 75&10@80
Nickel plated }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
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Trunk and clout nails.....dis 70&10@70&10&10
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Basket nails.....dis 70&10@70&10&10
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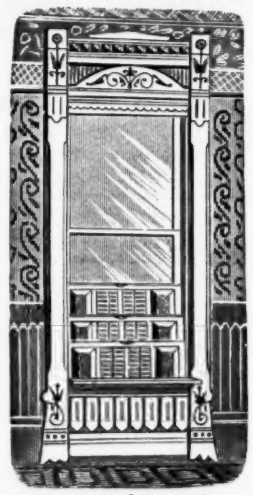

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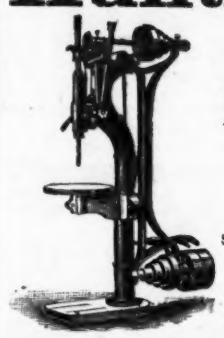

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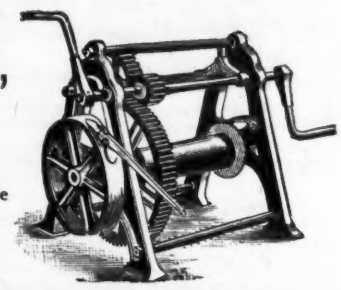

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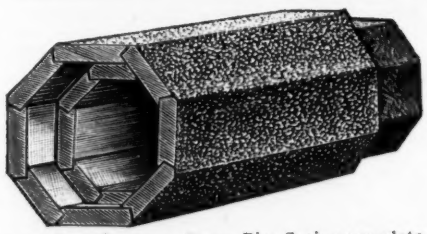

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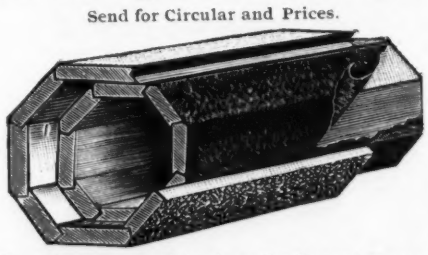

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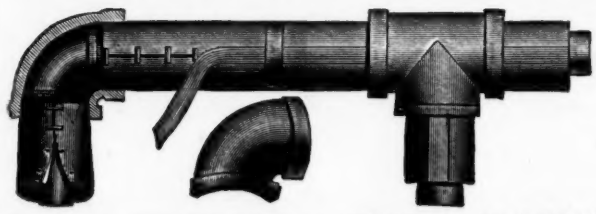

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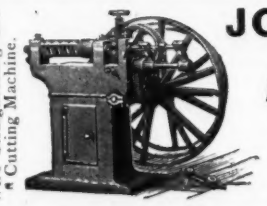

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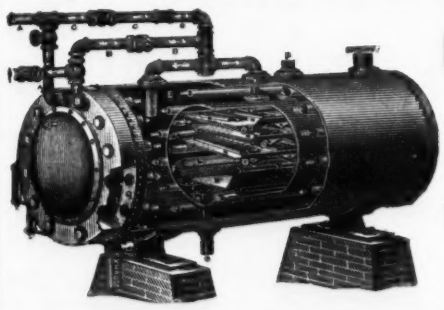

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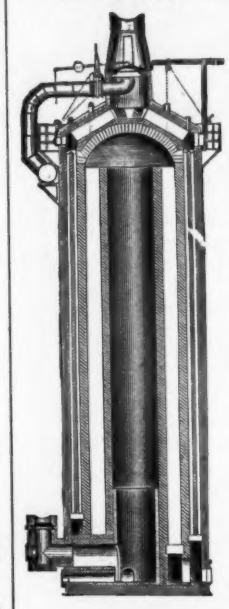

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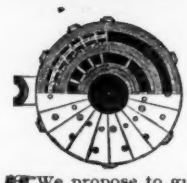

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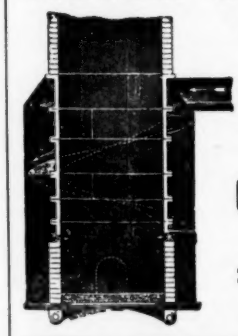

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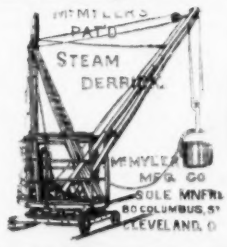

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PAGE.

Animal Pokes—
A. W. Bishop, Berea, O..... 15
Bath Tubs –
*Michigan Bath Tub Co.. Homer, Mich.... —
Blowers—
Buffalo Forge Co., Buffalo, N. Y..... 19
Boring Machines—
*J. H. Osborne & Co., Union City, Ind..... 10
Bolts and Bolt Machinery—
Hotchkiss & Upson Co., Cleveland 16
Colwell & Collins, Norway Bolt Co., Cleveland..... 16
*Seaton Mfg. Co., Cleveland..... 10
Brick and Tile Machines—
D. J. C. Arnold, New London, O..... 10
*Stevenson & Co., Wellsville, O. ..... —
Beltings—
Parkin & Bosworth, Cleveland..... 20
Belt Holders—
*W. R. Santley & Co., Wellington, O..... —
Boilers and Boiler Attachments—
J. C. McNeil & Co., Akron, O..... 16
Enterprise Boiler Co., Youngstown, O..... 16
Unique Lubricator Co., Mansfield, O..... 13
Columbia Injector Co., Cleveland..... 15
Penberthy Injector Co., Detroit, Mich..... 20
Detroit Lubricator Co., Detroit, Mich..... 16
Wm. B. Pollock & Co., Youngstown, O..... 18
Alliance Steam Boiler Works, Alliance, O 16
H. T. Sackett & Co., Fond du Lac, Wis..... 11
Bolt Cutters—
H. B. Brown & Co., East Hampton, Ct..... 17
Burglar Alarms—
Cuyahoga Manufacturing Co., Cleveland.. 11
Car Axles—
B. Barrett's Sons & Co., Wooster, O..... 14
Chaplets—
Forest City Machine Works, Cleveland... 16
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland..... 12
Coal Sieves—
Lock Haven Sifter Co., Lock Haven, Pa... 14
Cranes and Derricks—
McMyler Manufacturing Co., Cleveland..... 15
Wm. Tod & Co., Youngstown, O..... 18
Harmar Foundry & Machine Co., Harmar, O..... 18
Car Wheels—
Bowler & Co., Cleveland..... 13
Chemical Laboratory—
J. F. Elsom, New Albany, Ind..... 12
Clothes Bars—
Hulet, Holmes & Co., Berea, O..... 14
Damper Regulators—
*Curtis Regulator Co., Boston, Mass..... 19
Die Makers.
Avery Stamping Co., Cleveland..... 13
Door Hangers—
Taylor and Boggis Fdy. Co., Cleveland..... 20
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.. 15
*E. A. Schumacher, Cincinnati, O..... 11
Huntington & Lunt, Cleveland..... 14
*Lodge, Davis & Co., Cincinnati, O..... 20
W. F. & John Barnes' Co., Rockford, Ills.. 18
Drop Presses—
Williams, White & Co., Moline, Ill..... 11
Engineers and Contractors—
E. H. Jones & Co., Cleveland..... 18
Jas. P. Witherow, Pittsburgh, Pa..... 10
McClure & Schuler, Pittsburgh, Pa..... 15
Elevators—
L. S. Graves & Co., Rochester, N. Y..... 11
Houghton Foundry & Machine Co., Toledo, O..... 11
Explosives—
Hercules Powder Co., Cleveland..... 19
Electric Lighting Apparatus—
Brush Electric Co., Cleveland..... 14
Elevator Buckets.
Avery Stamping Co., Cleveland..... 13
Emery Wheel Dressers—
W. W. Brisben, Cleveland..... 18
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill..... 20
W. F. & John Barnes' Co., Rockford, Ill... 18
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland..... 14
Murray & Heiss, Cleveland..... 17
Union Electrotype Foundry, Cleveland.... 16
Engines (Steam)
Kilby Manufacturing Co., Cleveland..... 20
Novelty Iron Works, Canton, O..... 16
Aetna Machine Co., Warren, O..... 18
Wm. Tod & Co., Youngstown, O..... 18
E. H. Jones & Co., Cleveland..... 18
*Columbus Machine Co., Columbus, O..... —
*Chandler & Taylor Co., Indianapolis, Ind. 14
Buckeye Engine Co., Salem, O..... 19
The Westinghouse Machine Co., Pittsburgh, Pa..... 18
Geo. Worthington Co., Cleveland..... 18
Cleveland & Hardwick, Erie, Pa..... 18
Jas. Leffel & Co., Springfield, O..... 19
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 18
Van Duzen Gas Engine Co., Cincinnati, O..... 18
Engineers' Specialties—
Crescent Manufacturing Co., Cleveland... 16
*Curtis Regulator Co., Boston, Mass..... 19
Ejectors—
James Jenks, Detroit, Mich..... 16
Files, Makers of—
Reynolds Bros., Columbus, O..... 20
A. & H. Gough, Cleveland..... 15
Flue Cleaners—
Crescent Manufacturing Co., Cleveland..... 16
Forges—
Buffalo Forge Co., Buffalo, N. Y..... 19
Cleveland City Forge & Iron Co., Cleveland 20
Foundries—
Bowler & Co., Cleveland..... 13 & 16
Taylor & Boggis Foundry Co., Cleveland.. 16
Curry & Co., Meadville, Pa..... 16
Feed Water Heaters—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 20
Laidlaw & Dunn Co., Cincinnati, O..... 19
Armstrong Bros., Springfield, O..... 15
E. H. Jones & Co., Cleveland..... 18
For Sale—
Foundries, Furnaces, Machinery, etc..... 16
Foundry Cupolas—
Victor Colliau, Detroit, Mich..... 15
Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass..... 19
Feed Grinders—
*Enterprise Mfg. Co., Columbiana, O..... 10
Galvanizers.
Avery Stamping Co., Cleveland..... 13
Hardware—
W. Bingham Hardware Co., Cleveland..16 & 14
Eberhard Manufacturing Co., Cleveland... 16
Geo. Worthington Co., Cleveland..... 18
Bronson Supply Co., Cleveland..... 20
Heating Furnaces—
Beecher Furnace Co., Cleveland..... 11
Hydraulic Jacks—
Philip S. Justice & Co., Philadelphia, Pa.. 11
Iron and Steel Roofing—
Sykes Iron Roofing Co., Niles, O..... 19
Cambridge Iron Roofing Co., Cambridge, Ohio..... 19
Garry Iron Roofing Co., Cleveland 19
Standard Iron Co., Bridgeport, O..... 19
Kanneberg Roofing Co., Canton, O..... 19
Thompson Manufacturing Co., Cleveland, 19
W. G. Hyndman & Co., Cincinnati, O..... 19
Scott & Co., Cincinnati, O..... 17
*Canton Steel Roofing Co., Canton, O..... —
Iron (Malleable)—
Sweet & Clark Co., Marion, Ind..... 12
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland..... 12
Tuttle, Oglebay & Co., Cleveland..... 12
J. H. Outhwaite & Co., Cleveland..... 12
Condit, Fuller & Co., Cleveland, O..... 12
Pickands, Mather & Co., Cleveland....16 & 12
Hussey & Pomeroy, Cleveland..... 12
Iron Planers—
Smith & Silk, Cincinnati O..... 13
Lath Mills—
D. S. Abbott, Olean, N. Y..... 17
Lumber—
Martin & Barris, Cleveland..... 16
Lathes—
Muller Machine Co., Cincinnati, O..... 20
Sebastian, May & Co., Cincinnati, O..... 13
H. L. Shepard, Cincinnati, O..... 15
*Lodge, Davis & Co., Cincinnati, O..... 20
Mantels, Grates, Etc.—
Conger & Collins Mantel Co., Cleveland... 20
Milling Machines—
†Brown & Sharpe Mfg. Co., Providence, R.I. —
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O..... 13
Machinery—(General)
*Columbus Machine Co., Columbus, O..... —
Morgan Machine Co., Cleveland..... 17
Machinery (Foot Power)
W. F. & John Barnes' Co., Rockford, Ill... 18
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O..... 16
Novelty Iron Works, Canton, O..... 16
Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland.....20 & 20
E. E. Garvin & Co., New York..... 15
Office Furniture—
Burgess Bros, Cleveland..... 17
Cleveland Desk Co., Cleveland..... 17
Patents—
Osborne & Co., Cleveland..... 16
E. H. Bates, Washington, D. C..... 16
J. B. Cralle & Co., Washington, D. C..... 16
Plumbers and Steam Fitters—
Parker & Meikle, Cleveland..... 10
Power Hammers—
Philip S. Justice & Co., Philadelphia, Pa.. 11
Pumps (Steam)—
E. H. Jones & Co., Cleveland..... 18
Laidlaw & Dunn Co., Cincinnati, O..... 18
Hamar Foundry & Machine Co., Hamar, O..... 18
Paint—
Iron Clad Paint Co., Cleveland..... 15
Pipe Coverings—
John A. McConnell & Co., Pittsburgh..... 15
A. Wyckoff & Son,, Elmira, N. Y..... 15
Post Hole Augers—
*J. H. Osborne & Co., Union City, Ind..... 12
Printing Inks—
Ault & Wiborg, Cincinnati, O..... 17
Punching and Shearing Machine—
Williams, White & Co., Moline, Ill..... 11
Cleveland Hardware Co., Cleveland..... 14
Railway Supplies—
Bowler & Co., Cleveland..... 13
Cleveland City Forge & Iron Co., Cleveland..... 20
Railroads—
Time Tables, Etc..... 17
Reducing Valves—
*Curtis Regulator Co., Boston, Mass..... 19
Rivets—
Forest City Machine Works, Cleveland..... 16
Sash Balances—
Caldwell Manuf'g Co., Rochester, N. Y..... 10
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland..... 12
Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass..... 19
A. A. Griffing Iron Co., Jersey City, N. J... 11
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 14
Type Founders—
Franklin Type Foundry, Cincinnati, O... 17
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland..... 16
Saws—
Detroit Saw Works, Detroit, Mich..... 14
Northwestern Saw Works, Toledo, O..... 16
Peter Gerlach & Co., Cleveland..... 11
Shapers—
*Lodge, Davis & Co., Cincinnati, O..... 29
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland..... 12
Sheet Steel—
Standard Iron Co., Bridgeport, O..... 19
Split Pulleys—
Geo. Worthington Co., Cleveland 18
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa..... 13
Steam Fitters' Supplies—
A. A. Griffing Iron Co., Jersey City, N. J... 11
Stampers of Sheet Metal—
Avery Stamping Co., Cleveland..... 13
Tinning Steel, Etc.
Avery Stamping Co., Cleveland..... 13
Torches—
Schneider and Trenkamp Co., Cleveland. 11
Trucks and Wheelbarrows—
Lansing Wheelbarrow Co., Lansing, Mich..... 13
Twist Drills—
Cleveland Twist Drill Co., Cleveland..... 20
*Standard Tool Co., Cleveland..... —
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland..... 20
Water Columns—
Reliance Gauge Co., Cleveland..... 20
Window Blinds—
Hartman & Durstine, Wooster, O..... 14
Wire Goods—
F. Powell & Co., Toledo, O..... 20
Wire Machinery—
John Adt & Son, New Haven, Conn..... 15
Wood-Working Machinery—
D. S. Abbot, Olean, N. Y..... 17
Frank & Co., Buffalo, N. Y..... 11
Standard Mfg. Co., Moore's Hill, Ind..... 12
Wrenches—
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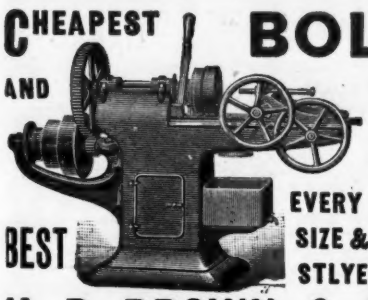

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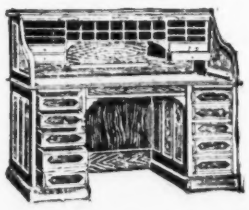

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Standard Time.
Revised March 6th, 1888.

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Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	8 00 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 40 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 05 p m
Akron & Orrville Accom	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom		†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:55 a. m., 3:05 p. m.
Canton—6:55 a. m., 3:05 p. m., 6:20 p. m.
Kent—6:55 a. m., *8:50 a m., 3:05 p. m., 6:20 p. m., *8:15 p. m.
Bedford—6:55 a. m., *8:50 a. m., 11:10 a. m., 1:30 p. m., 3:05 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 6:55 a. m., *8:50 a. m., 11:10 a. m., 1.30 p. m., 3:05 p. m., 4:40 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:25 a. m., 6:30 p. m.
Canton, 10:25 a. m., 2:35 p. m., 6:30 p. m.
Kent—*7:45 a. m., 10:25 a. m., 2:35 p. m., 6:30 p. m., *7:10 p. m.
Bedford—6:00 a. m., *7:45 a. m., 10:25 a. m., 1:05 p. m., 2:35 p.m., 4:15 p. m., 6:30 p.m., *7:10 p.m.
Newburgh—6:00 a. m., 7:10 a. m., *7:45 a. m., 10:25 a. m., 1.05 a. m., 2:35 p. m., 4:15 p. m., 5:35 p. m., 6:30 p. m., *7:10 p. m.
Canton and intermediate stations (Sundays only), 9:50 a. m., 6:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

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Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

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	Depart.
No. 62, Accommodation	† 6 05 a m
No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 25 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Jamest'n, Pitts. & Y'ngst'n Ex	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*10 05 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Youngstown Local	* 2 10 p m
No. 67, Pittsburgh Express	†12 30 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 8 55 p m
No. 73, Mantua Accommo	* 7 20 p m

*Daily. †Daily, except Sunday.

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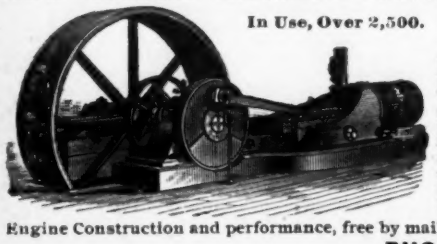

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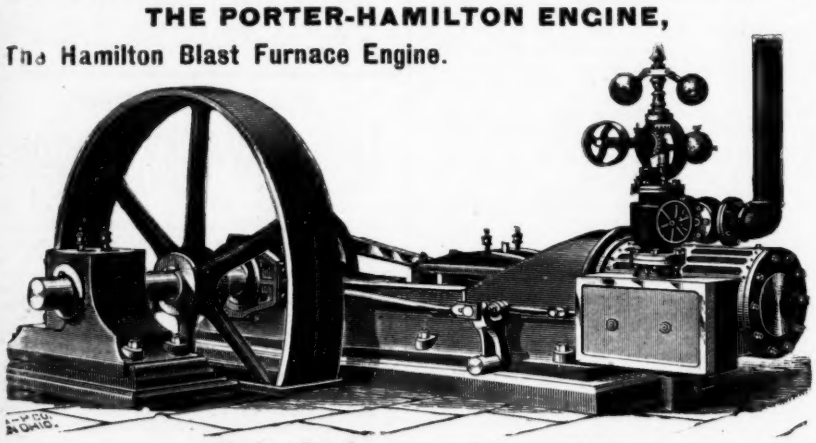

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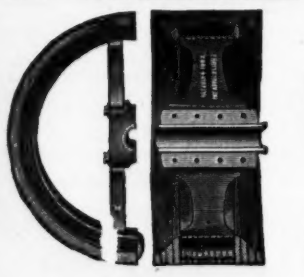

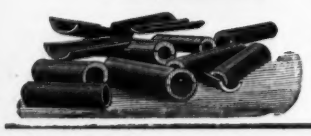

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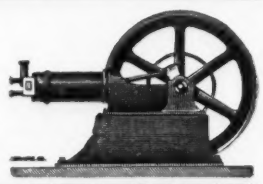

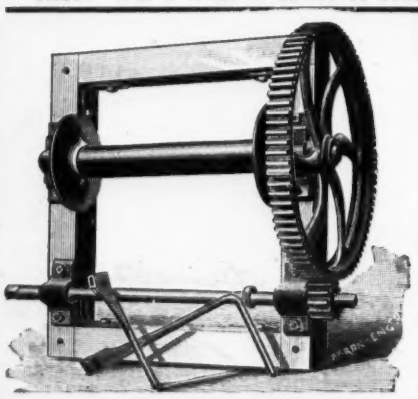

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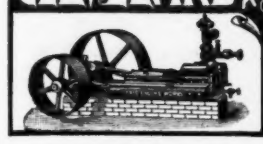

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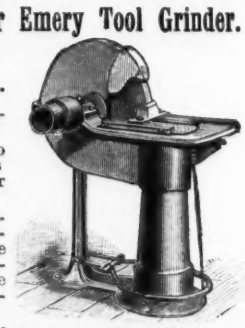

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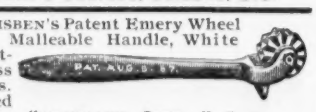

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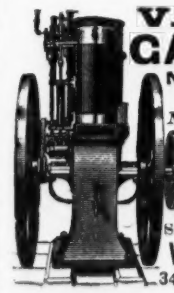

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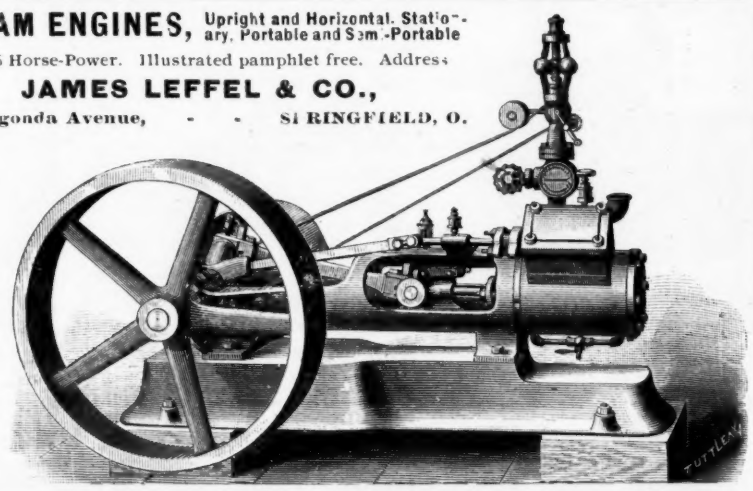

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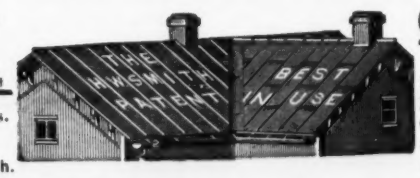

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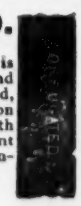

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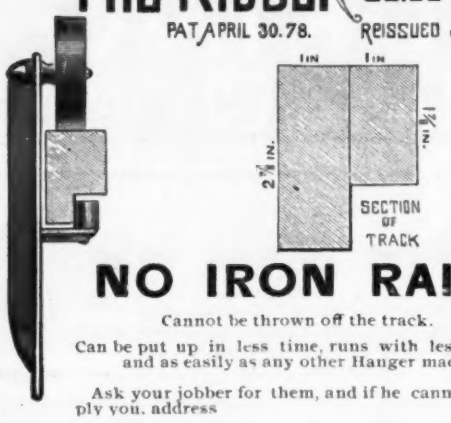

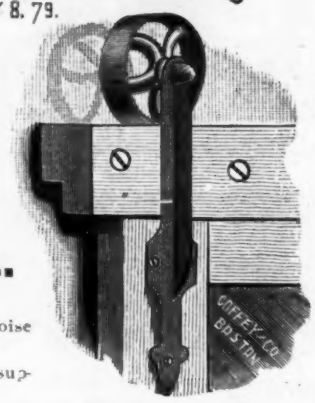

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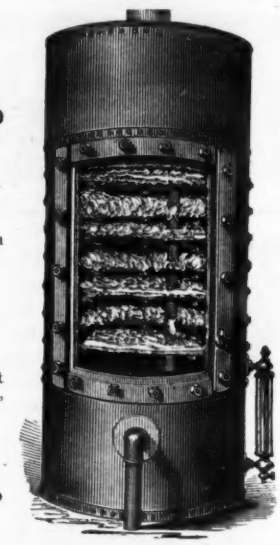

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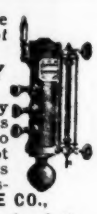

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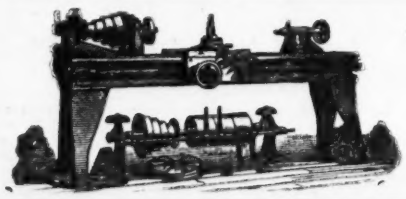

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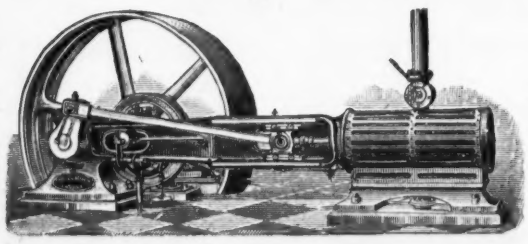

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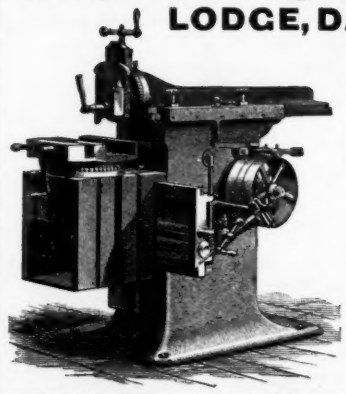

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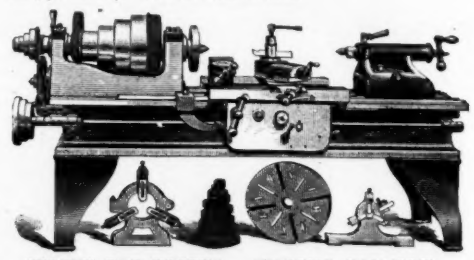

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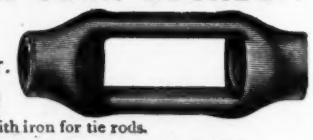

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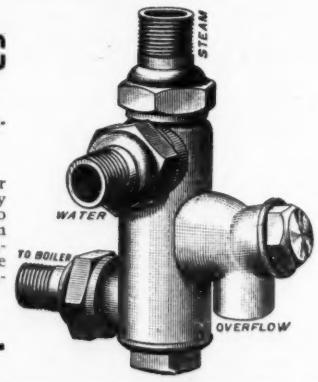

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